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# Apple Scanner

## Technical Procedures

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# Apple Scanner

## Section 1 – Basics

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## □ PRODUCT DESCRIPTION

### Overview

The Apple® Scanner and OneScanner™ are optical image readers designed to support the Macintosh® family of CPUs. These scanners are 300-dot-per-inch (dpi), 8.5-by-14-inch flat-bed devices. Features include halftone support for desktop publishing, Grayscale (1 bit/16 levels), variable scanning resolutions of 75 to 300 dpi, and high-speed data transfer using the built-in SCSI port. The Apple Scanner is a 4-bit scanner that can detect 16 shades of gray, from absolute white to absolute black. The Apple OneScanner is an 8-bit scanner that can detect 256 shades of gray, from absolute white to absolute black.

**Note:** Throughout this documentation, we refer to these two scanners as one. Whenever we need to distinguish between the two, we refer to them as the *4-bit scanner* (Apple Scanner) or the *8-bit scanner* (Apple OneScanner).

The scanner, along with the software application AppleScan™, allows you to make quality reproductions of the items you scan. The scanner is capable of digitizing any document, whether it is a graphics image or a page of text.

### How It Works

To begin a scan, place an item (original) on the glass bed of the scanner and close the lid. From the host computer, start the AppleScan application. The host computer sends commands and parameters to the scanner. These commands and parameters set scanning values within the scanner or instruct the scanner to perform some specific function.

The light of the scanner reflects off the original as the light moves down the scanner bed. The scanner detects variations in the light reflected from the gray shades in the original. The particular shade of gray at any particular point in the original is called its reflection density, or simply density.

For example, the scanner handles an 8.5-inch-by-11-inch document as an array of more than 8,000,000 dots when scanning at 300-dpi. The array, called a bitmap, is a digitized image of the original document. Depending upon other parameters specified by the user, each dot in the bitmap is either black, white, or a shade of gray.

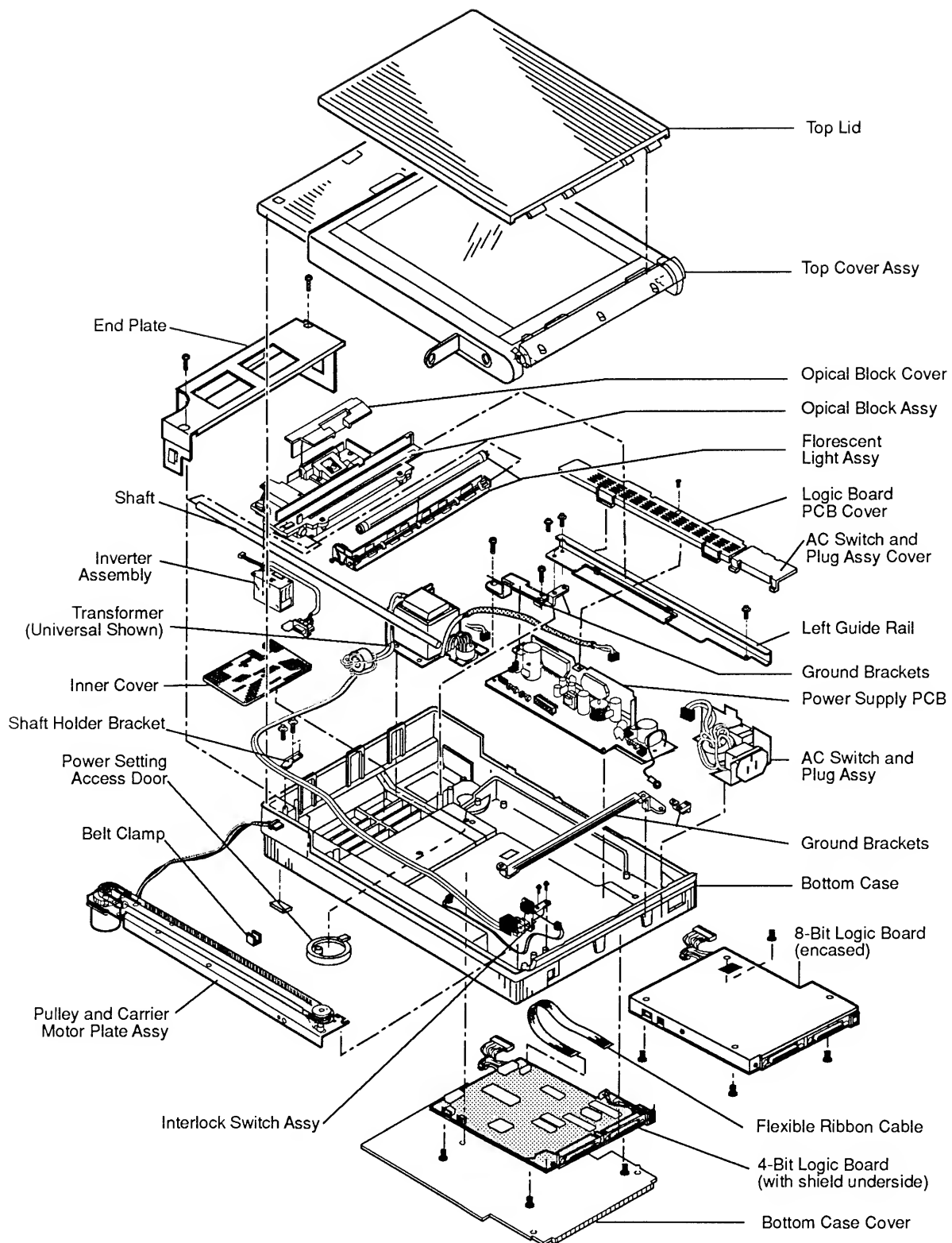
The scanner records in digital format (in memory and on disk) what you instruct it to record with your AppleScan application. Depending on the kind of original you scan and on the purpose you have in mind for the image, the application records what the scanner detects in one of three ways (called composition types): line art, halftone, or grayscale composition.

- Line art composition – The scanner records each point scanned as either black or white, depending on a threshold value you set.
- Halftone composition – The scanner records each point scanned as either black or white, depending on the particular halftone pattern and the contrast and brightness values you set.
- Grayscale composition – The scanner records each point scanned at the exact level of gray the scanner detects. You can display grayscale composition images on certain monitors. You can convert grayscale composition images to halftone or line art images as well.

After the image is saved, you can use any of several different programs to reproduce the image as a printed version or as a screen display. AppleScan files work with page-layout programs and other graphics programs. You can also print the image directly from the AppleScan application.

### **Major Assemblies and Components**

Figure 1-1 shows the major assemblies and components of the scanner.



**Figure 1-1 Major Assemblies and Components of the Scanner**



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## □ SPECIFICATIONS

Dimension (maximum)	Depth	545 mm	
	Width	340 mm	
	Height	110 mm	
Weight	4-bit scanner	20 lbs (9.07 kg)	
	8-bit scanner	23 lbs (10.43 kg)	
Power Supply Line Voltage	USA model:	120 VAC ±10% 58–62 Hz	
	Universal model:	100/120/200/220/240 VAC ±10% 58–62 Hz	
Power Consumption	Standby	4-bit scanner <35 Watts	8-bit scanner <22 Watts
	Scanning	<65 Watts	<45 Watts
Paper Size	Maximum width	8.50" (215.9 mm)	
	Maximum length	14.0" (355.6 mm)	
Noise	Standby	<30 dB	
	Scanning	<55 dB	
Environmental	Operating temperature:	+10° to +40° C	
	Storage (6 months):	-40° to +47° C	
	Transit (72 hours):	-40° to +65° C	
	Noncondensing humidity in storage (6 months):	20% to 95% RH	
Scanning Method	Flat-bed optical image scanning type. Scans any object laid flat on glass scanning bed. Document is stationary; scanning mechanism moves.		
Sensor	A flat-bed scanning charge coupled device (CCD) and focusing lenses capture line images. The CCD contains 2592 cells to capture the line images at a maximum rate of 300 dpi.		

**Scan Time  
(4-Bit Scanner)**

B/W mode	Halftone or Grayscale mode	B/W Halftone mode
5 ms per line	8 ms per line	16 ms per line

**Scan Time  
(8-Bit Scanner)**

In high-speed mode:

B/W	Halftone	4-bit gray	8-bit gray
10 s per page	10 s per page	21 s per page	37 s per page

(High-speed mode is the default setting; you can also choose normal speed, in which the carriage moves a little slower, or fast speed, in which the carriage moves a little faster.)

**Scanning Density  
(4-Bit Scanner)**

The following horizontal and vertical densities can be selected independently:

B/W or Halftone mode	300, 285, 270, 255, 240, 225, 210, 200, 195, 180, 165, 150, 135, 120, 105, 100, 85, 75 dpi
Grayscale mode	300, 200, 150, 100, 75 dpi

**Scanning Density  
(8-Bit Scanner)**

Horizontal and vertical density can be selected independently and can be set anywhere between 72 and 300 dpi.

**Clock Speed**

12 MHz

**Memory**

16K RAM  
32K ROM

## □ THEORY OF OPERATION

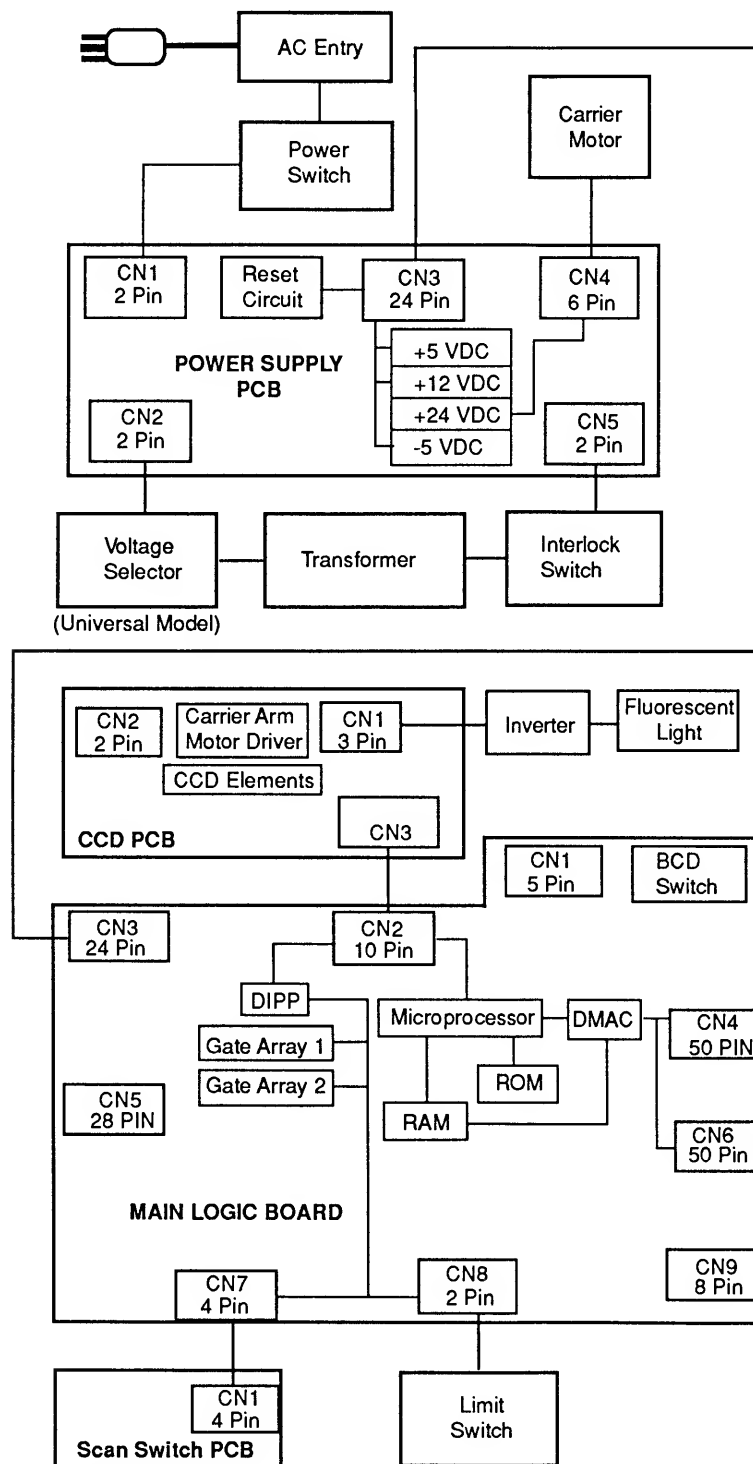


Figure 1-2 Scanner Block Diagram

## Overview

Refer to the block diagram, Figure 1-2, when reading this section.

Initial reset of the devices is through the reset circuit on the power supply PCB. This reset circuit assures that all the components on the main logic PCB are in a known state after the power is on.

When the scanner receives a command to start a scan, the microprocessor activates the light source (a green fluorescent lamp) in the scanning carrier assembly and activates the carrier assembly motor (which sets the carrier assembly in motion).

As the light scans the document, a series of mirrors and lenses gathers the reflected light into the light-sensitive charge coupled device (CCD) arrays. Each pixel uses three layers of CCD elements. The CCD array is on the CCD PCB, which is mounted on the carrier assembly. The array is a 1-pixel-by-2592-pixel matrix, three layers deep. Each of the 2592 CCD elements in the top layer holds one picture element (pixel) of a scan line. A scan line is defined as 2592 pixels wide by one pixel (approximately 1/300 inch by 8-1/2 inches). The other two layers buffer the picture elements (called a bitmap image) until the elements are transferred to the image-processing circuitry.

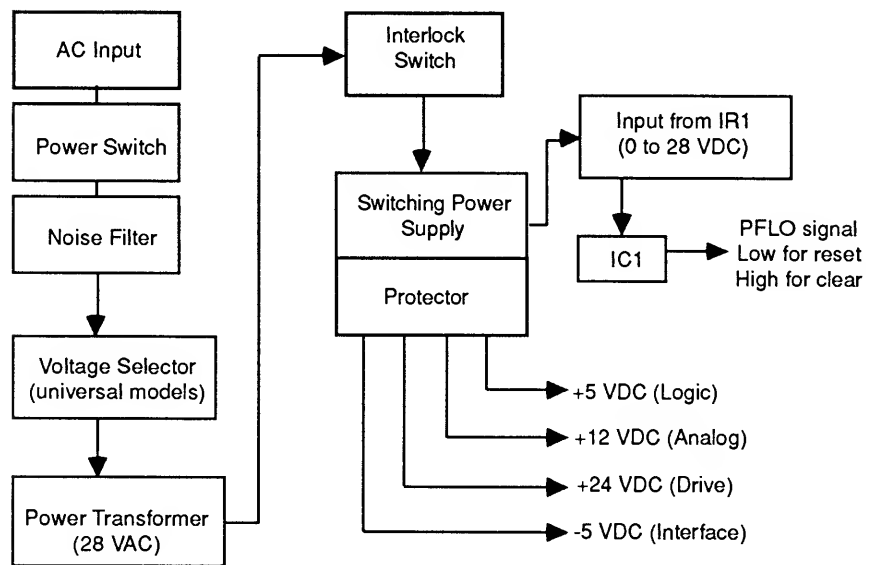
From the CCD array, the bitmap image is transferred to the preprocessing circuit on the main PCB for waveform reformation and then analog-to-digital conversion.

Once the data is in a digital format on the main PCB, the CPU processes the data and sends the data through the interface circuitry back to the host computer, where the document reforms on the host computer screen.

## Power Circuit

The internal power circuit (see Figure 1-3) for the scanner consists of an AC line filter, a voltage selector (for universal models), a power transformer, a switching power supply with protector circuit, and a reset circuit. The AC power passes through the power on/off switch, the noise filter, and the transformer. The power transformer steps down the voltage and provides 28 VAC. This voltage flows through the interlock (top cover interlock) to the switching power supply. The switching power supply provides the following DC voltages:

- +5 VDC for the main logic board circuits
- +12 VDC for the analog scanning circuitry
- +24 VDC for the stepper motor that drives the scanning unit across the glass bed
- -5 VDC for the SCSI devices



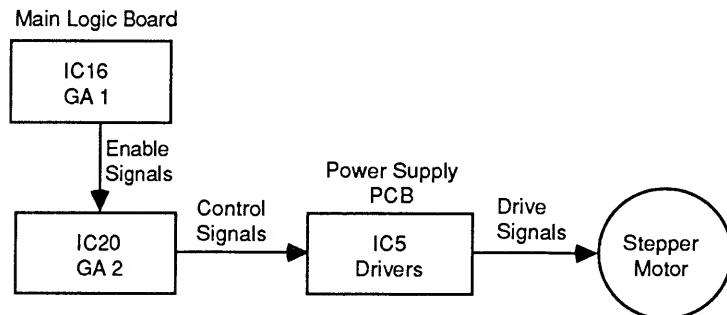
**Figure 1-3 Power Circuit Block Diagram**

## Reset Circuit

The reset circuit (Figure 1-3) consists mainly of IC1 and supporting circuitry. When you switch the unit on, the reset stays on (low state) while the logic voltage is below 4.75 VDC. This voltage keeps all the devices on the main logic PCB in a reset state until the logic voltage rises above 4.75 VDC. Above this voltage level, the reset IC changes states, which clears the reset.

## Carrier Motor

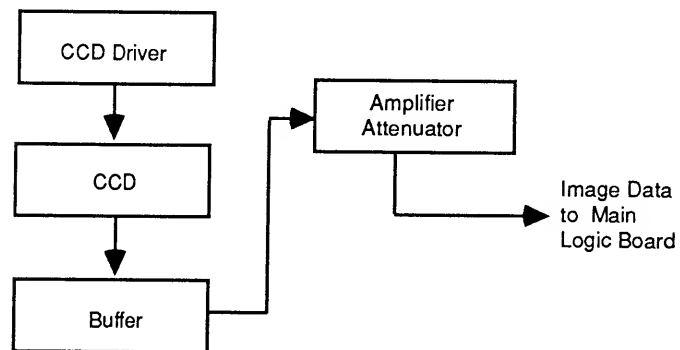
The carrier motor drive circuit (Figure 1-4) consists of gate array 2 and gate array 1 on the main logic PCB, and IC5 on the power supply board. Gate array 2 (IC20) generates the drive signals and speed control signals. Gate array 1 (IC16) generates the enable signal. These signals pass through connector CN3 to IC5 on the power supply board. From IC5 the signals move to the 4-2 phase excitation stepping motor through CN4.



**Figure 1-4 Carrier Motor Block Diagram**

## CCD PCB

The charge coupled device (CCD) PCB (Figure 1-5) contains the image-sensing logic and the carrier arm motor driver.



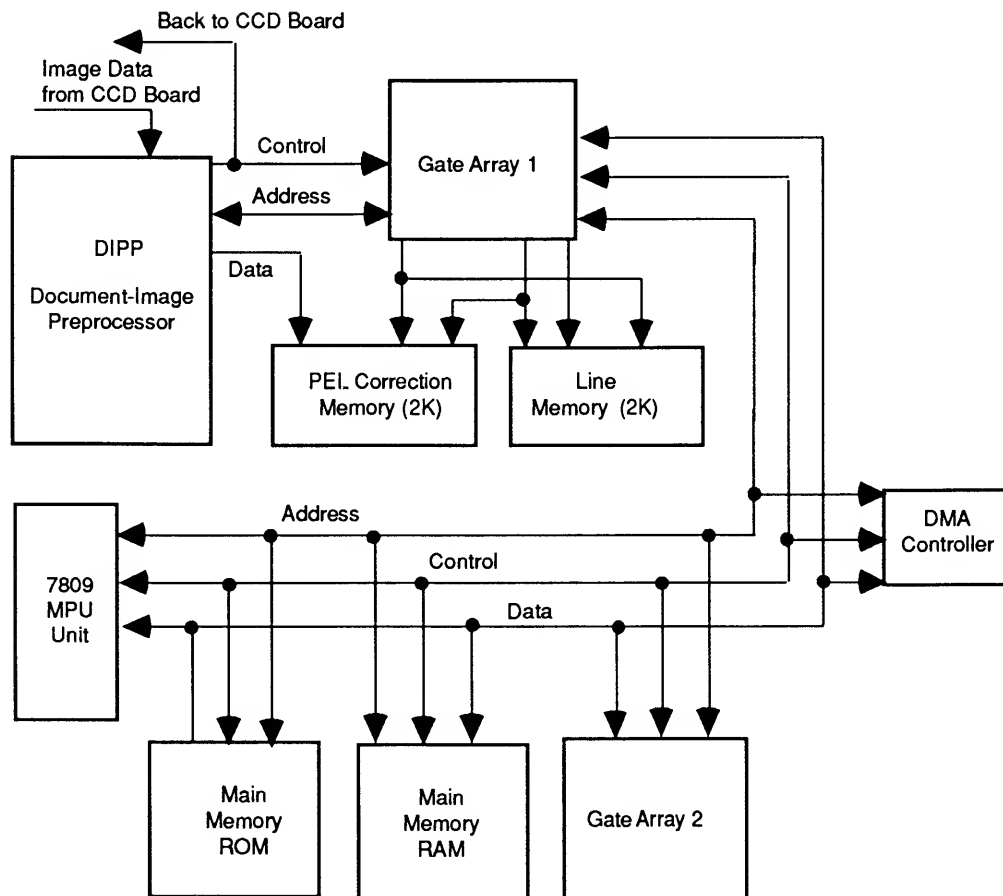
**Figure 1-5 CCD PCB Block Diagram**

## Image Sensing

As the reflected light falls on the CCD array elements, each element in the top layer is charged. Once charged, the element shifts its charge to the second layer and then to the third layer of CCD elements. From the third layer the contents are serially shifted, one pixel at a time, to the image-processing circuitry for cleanup and amplification. The analog charge values pass through an attenuator and then to the main logic board for image processing, distortion correction, and analog-to-digital conversion.

## Main Logic Board

Figure 1-6 is a block diagram of the circuits on the main logic board.



**Figure 1-6 Main Logic Board Block Diagram**

## Microprocessor

The scanner uses an 8-bit 7809 microprocessor running on a 12-MHz clock. The microprocessor controls the functions of the gate arrays, the DMAC, and the carriage motor.

### *Main Memory*

The main memory consists of 16K of RAM and 32K of ROM. The ROM contains the firmware to control the scanner. The RAM buffers the image data and also provides the microprocessor with working memory space for parameter information. Of the 16K available, 10K is used specifically to buffer the image data between scanning and transfer to the host computer.

### *Image Processing*

The image-processing circuitry consists of the document-image preprocessor (DIPP), gate array 1, gate array 2, line memory, and the picture element (PEL) correction memory. The DIPP is the main device used in image processing and is supported by the other parts of the circuit.

The DIPP is an image signal processor that takes the analog image data from the CCD array, corrects any distortion, digitizes the corrected analog data, and transfers the digital data to main memory.

Gate arrays 1 and 2 support the DIPP. Gate array 1 supports reduction options by controlling the line memory. If an image requires reduction, it passes to the line memory for buffering before transferring to the main memory. Other functions of gate array 1 include address generation, memory control, bus interface, gray-scale horizontal-resolution conversion, and CCD control.

Gate array 2 supports the following functions: direct memory access control, bus arbitration, interrupt control, carrier motor control, address latching, and chip select control.

The line memory and PEL correction memory are two 2K RAM chips that buffer data from the DIPP before sending the data to main memory. Image correction and other processing take place in this memory, line-by-line.

### *DMAC*

Once the data is corrected, digitized, and stored in memory, the direct memory access controller (DMAC) circuit, working in conjunction with the CPU, controls the transfer of image data to the host computer. While working along with the microprocessor, this circuit executes a faster data transfer.



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## **□ PREVENTIVE MAINTENANCE**

### **Glass Top**

To clean the glass top

1. Make sure the power is off.
2. Lift the lid to the open position.
3. Wipe the glass with water or a light detergent and a clean, soft, lint-free cloth. Do not use benzene, thinner, or any other volatile chemicals.

### **Underside of Glass**

To clean the underside of the glass

1. Remove the lid and the case top (see Section 2, Take-Apart).
2. Clean the underside of the glass as in step 3 above.

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# Apple Scanner

## Section 2 – Take-Apart

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2.28	Main Logic PCB

**Note:** If a step is underlined, detailed instructions for that step can be found elsewhere in this section.

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## □ INTRODUCTION

The Take-Apart procedures refer to the left side, right side, front, or back of the scanner, as shown in Figure 2-1. You must use the same orientation when you perform these procedures. If a view is different, the graphic will show the new orientation.

### **Materials Required**

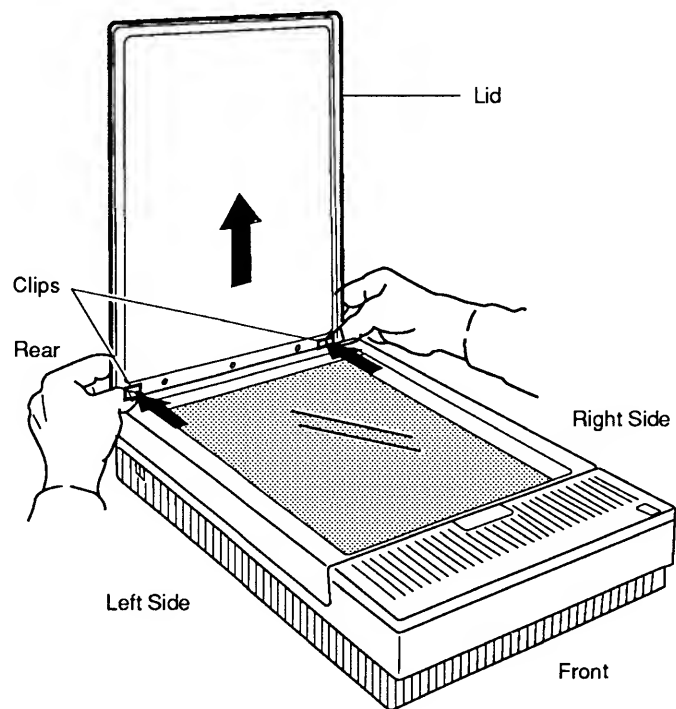
Flat-blade screwdriver  
Long Phillips screwdriver  
Jeweler's screwdriver

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## □ LID

### Remove

1. **Figure 2-1.** Lift the lid up all the way to 90°.
2. **Figure 2-1.** Press the two indented clips near the bottom of the lid on both sides. As you press in the clips, gently pull up on the lid and remove it.



**Figure 2-1 Lid**

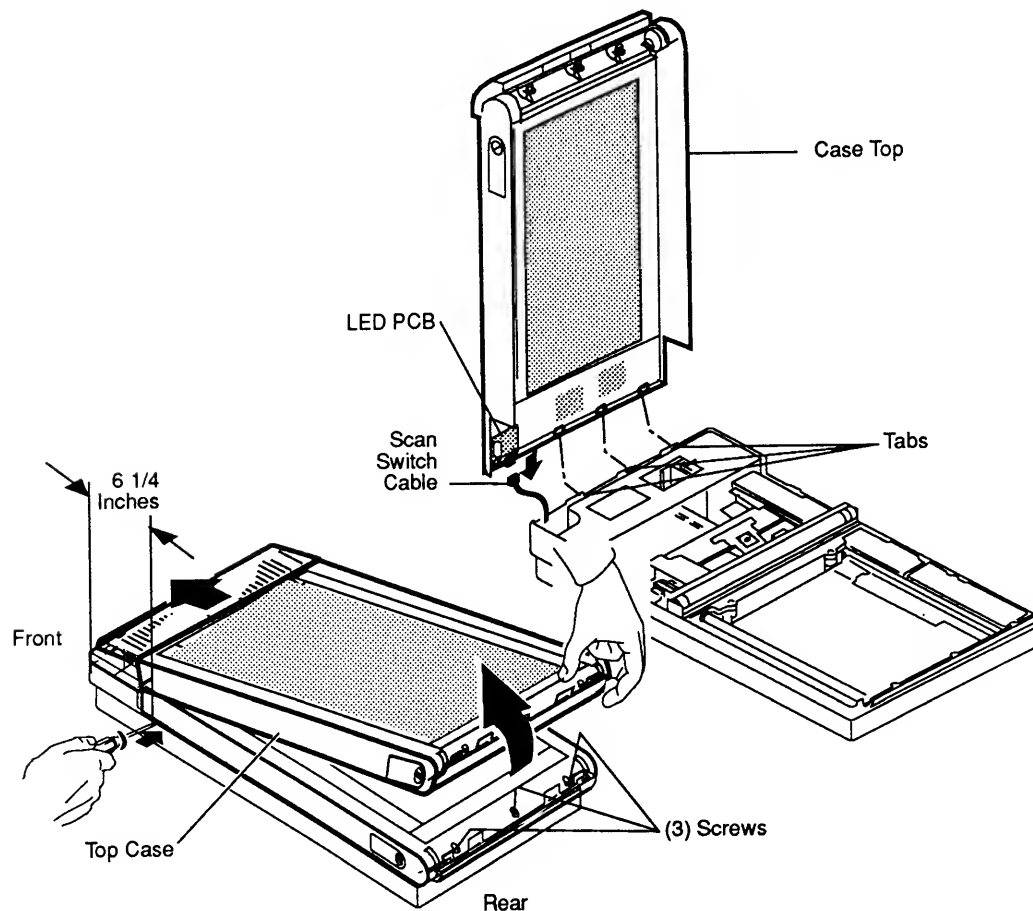
### Replace

Line up the slots on the lid with the tabs on the scanner, and gently push the lid down so that the tabs fit into the slots. Also make sure that the clips snap into the cutouts.

## □ CASE TOP

### Remove

1. Remove the lid.
2. **Figure 2-2.** Loosen the three Phillips screws along the top rear of the scanner. These screws do not come out all the way. Unscrew them until they are loose enough to release the case top.



**Figure 2-2 Top Case**

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**CAUTION:** *Be careful of the LED PCB, which has parts that project and can snag and bend.*

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3. The case top is held in place by two clips (one on the right side and one on the left) located 6-1/4 inches from the front of the unit. (You can view these clips under the glass plate.) While lifting the case top from the rear, press in with a flat-blade screwdriver to release these clips. Do not twist the screwdriver or you may mar the case.
4. **Figure 2-2.** Swing the case top up and forward toward the front of the scanner.
5. **Figure 2-2.** When the case top reaches the top of the swing (90°), remove the scan switch cable from the LED PCB located at the right-front side of the case top.
6. If you are replacing a defective case top, remove the LED PCB.

## Replace

1. If necessary, replace the LED PCB.
2. Place the case top 90° to the front of the bottom case. Align the front of the case top with the front of the bottom case and make sure that the three tabs align with the three slots in the bottom case. Also make sure that the LED is aligned with the cutout on the bottom case. Hold the case in this position until you complete the next step.
3. **Figure 2-2.** Attach the scan switch cable to the LED PCB on the right front side of the case.
4. Slowly lower the case top. Swing the top toward the back of the bottom case until the top fits completely on the bottom case.
5. **Figure 2-2.** Secure the case top with the three screws.
6. Replace the lid.

## ❑ SCANNING CARRIER ASSEMBLY—OPTICAL BLOCK

The carrier assembly consists of the optical block, light assembly, drive belt, and shaft.

### Remove

1. **Figure 2-3A.** Use a coin or a flat-blade screwdriver to open the light assembly access door, which is located on the right side of the case top.
2. **Figure 2-3B.** Loosen the Phillips screw on the light assembly. This screw does not come out, but it has to be completely loose.

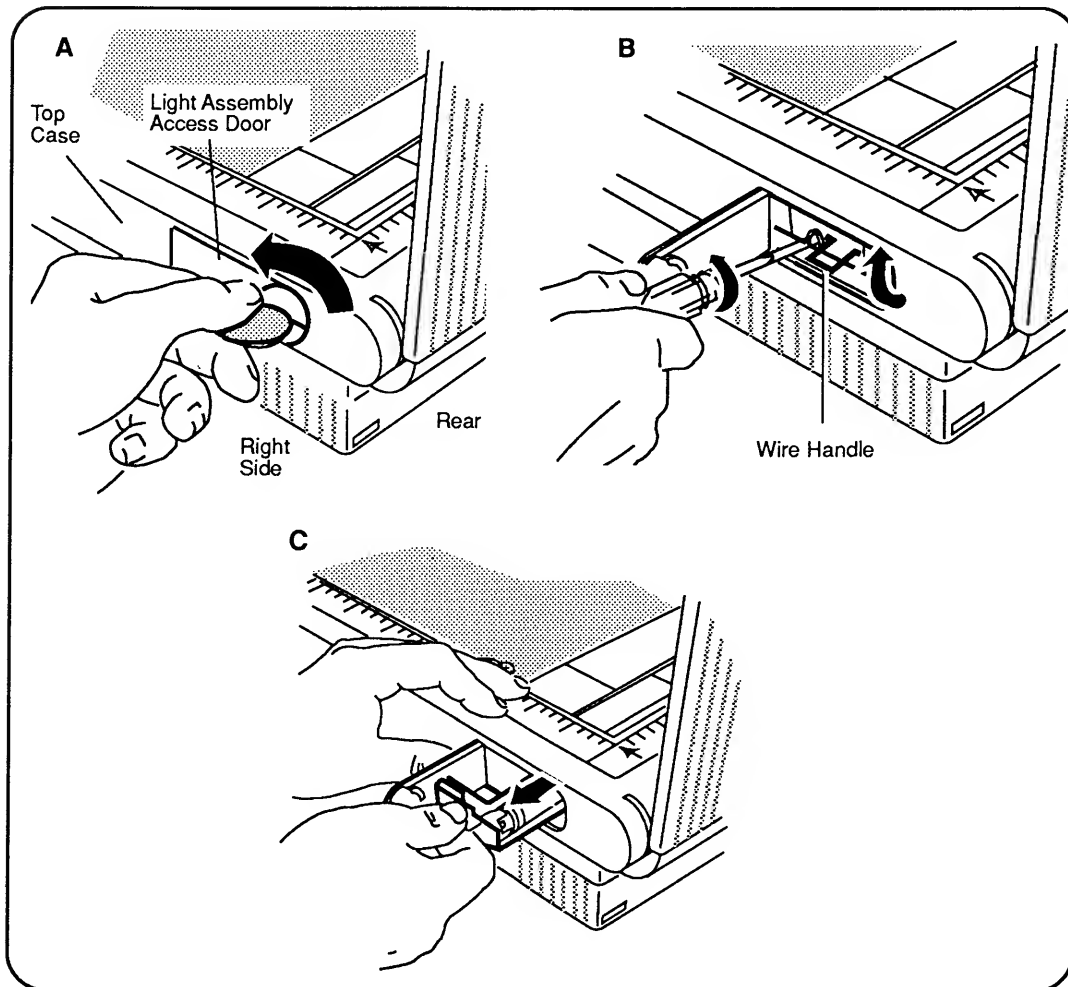
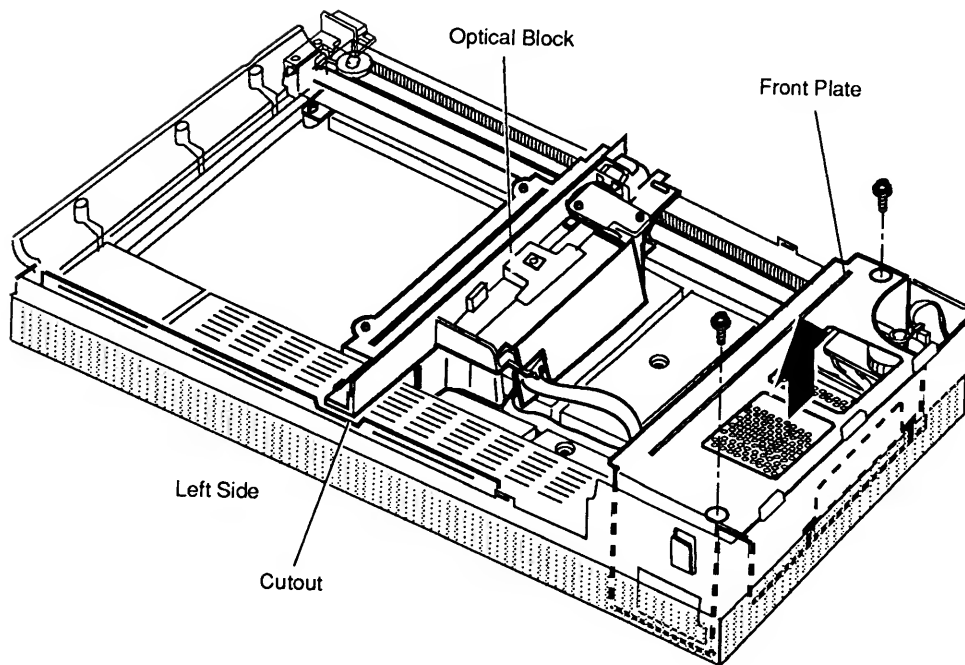


Figure 2-3 Light Assembly



3. **Figure 2-3B and C.** Raise the wire handle to a horizontal position and then pull straight out. The light assembly will disengage from the electrical connector and slide out.
4. Remove the lid and the case top.



**Figure 2-4 Optical Block and Front Plate**

5. **Figure 2-4.** Slide the optical block to the center of the scanner (you will have to push fairly hard) so that the left side of the optical block aligns with the cutout on the left-side rail.
6. **Figure 2-4.** Remove the two screws holding the front plate in place.

**Note:** The screw on the left side (near the transformer) is secured to the bottom of the case. To reach it, you will need a #1 Phillips screwdriver with a four-inch shaft.

7. Firmly pull up and lift out the front plate.

8. **Figure 2-5A.** Remove the two screws that secure the interlock assembly and shaft holder bracket. Move the bracket slightly to the side.
9. **Figure 2-5B.** Loosen the tension lock screw on the carrier.
10. **Figure 2-5B.** Loosen the tension on the belt by swinging the pulley lever toward the front, and remove the belt from the rear pulley gear.
11. **Figure 2-5C.** Remove the belt from the front pulley gear.
12. **Figure 2-5D.** Remove the two screws that secure the front shaft holder bracket. This bracket is removable.
13. Release the shaft from the rear bracket and gently lift up on both sides of the shaft. Be careful not to raise the optical block too high.
14. When the shaft clears the bracket mounts, nudge the left side of the assembly (which is riding on a rail) with your thumb. This movement dislodges the assembly from the rail (**Figure 2-5E**). Once the optical block is loose from the rail, do not try to lift the assembly up all the way until after you do the next step.

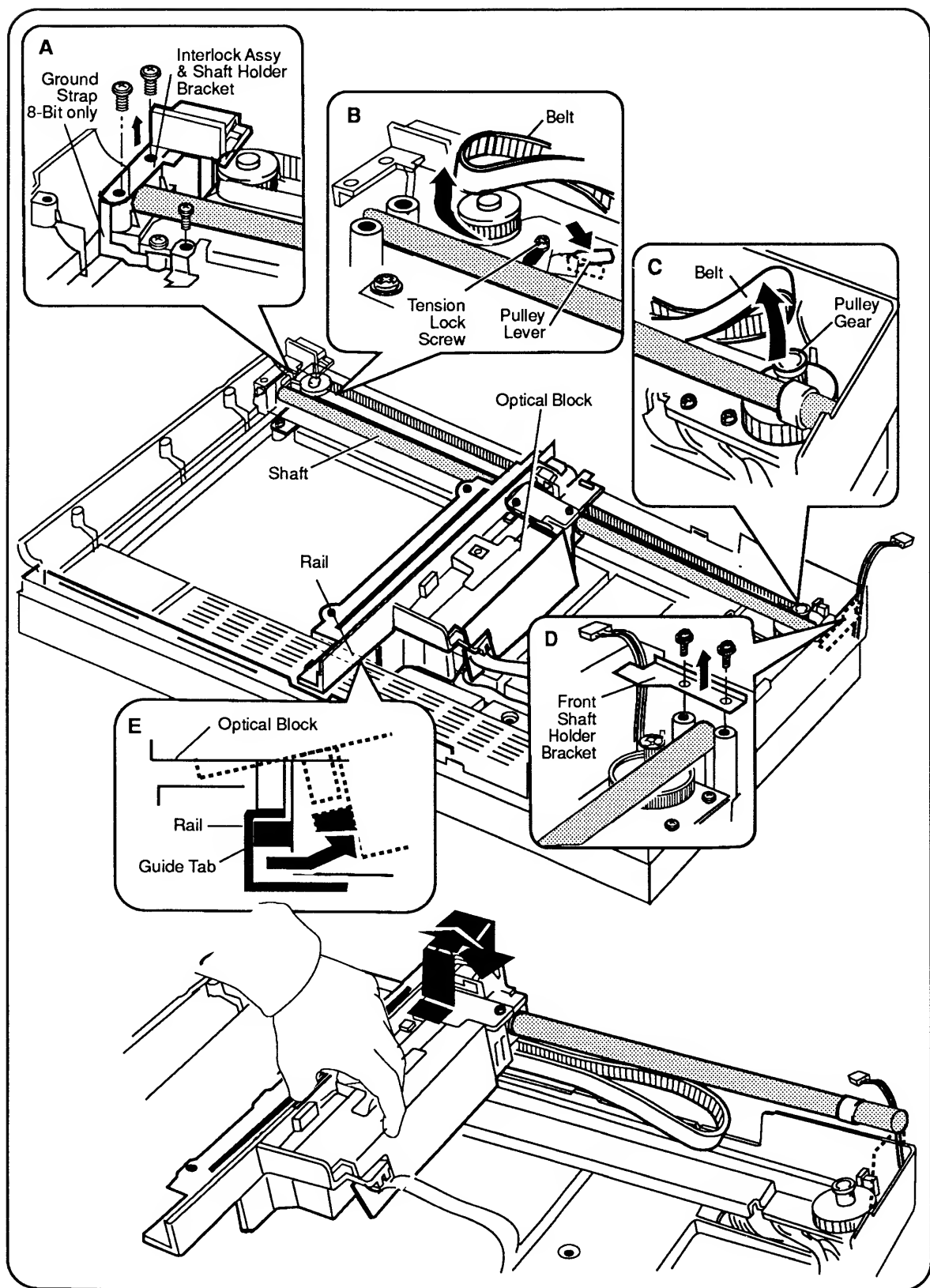


Figure 2-5 Optical Block and Drive Belt

15. **Figure 2-6A/B.** Disconnect the flexible cable from connector CN1 on the optical block assembly by gently pulling down on the bottom part of the connector. The cable will fall loose.
16. 4-bit scanner: Remove the cable by sliding the cable to the open side.  
  
8-bit scanner: Use your fingers or a flat-blade screwdriver to open the ferrite bead retainer. Slide the ferrite bead (with the flexible cable) free from the optical assembly.
17. **Figure 2-6C.** Lift out the optical block assembly.
18. Remove the shaft from the optical assembly by pulling it out as shown in **Figure 2-6D.**
19. **Figure 2-6E.** Remove the belt from the optical block assembly as follows:
  - a) Remove the clip that covers where the belt attaches to the optical block. Use a jeweler's screwdriver, if necessary, to pry the clip loose.
  - b) Pull the belt straight out. The plastic slot is molded with ridges that match the grooves on the belt.

## Replace

1. **Figure 2-6E.** Attach the belt to the optical block. The grooves in the belt fit into the molded grooves on the block. Secure the belt with the clip. (You may need use a screwdriver to pry the clip apart.)
2. Insert the shaft into the optical block as shown in the **Figure 2-6D.**
3. Lay the optical assembly on the top of the scanner.
4. **Figure 2-6A.** 4-bit scanner: Attach the flexible cable to connector CN1 on the CCD PCB. Make sure the cable is looped around the connector.

**Figure 2-6B.** 8-bit scanner: Place the ferrite bead (with the flexible cable attached) in the ferrite bead retainer. Place the cable in connector CN1 and push up on the bottom of the connector to latch the cable in place.

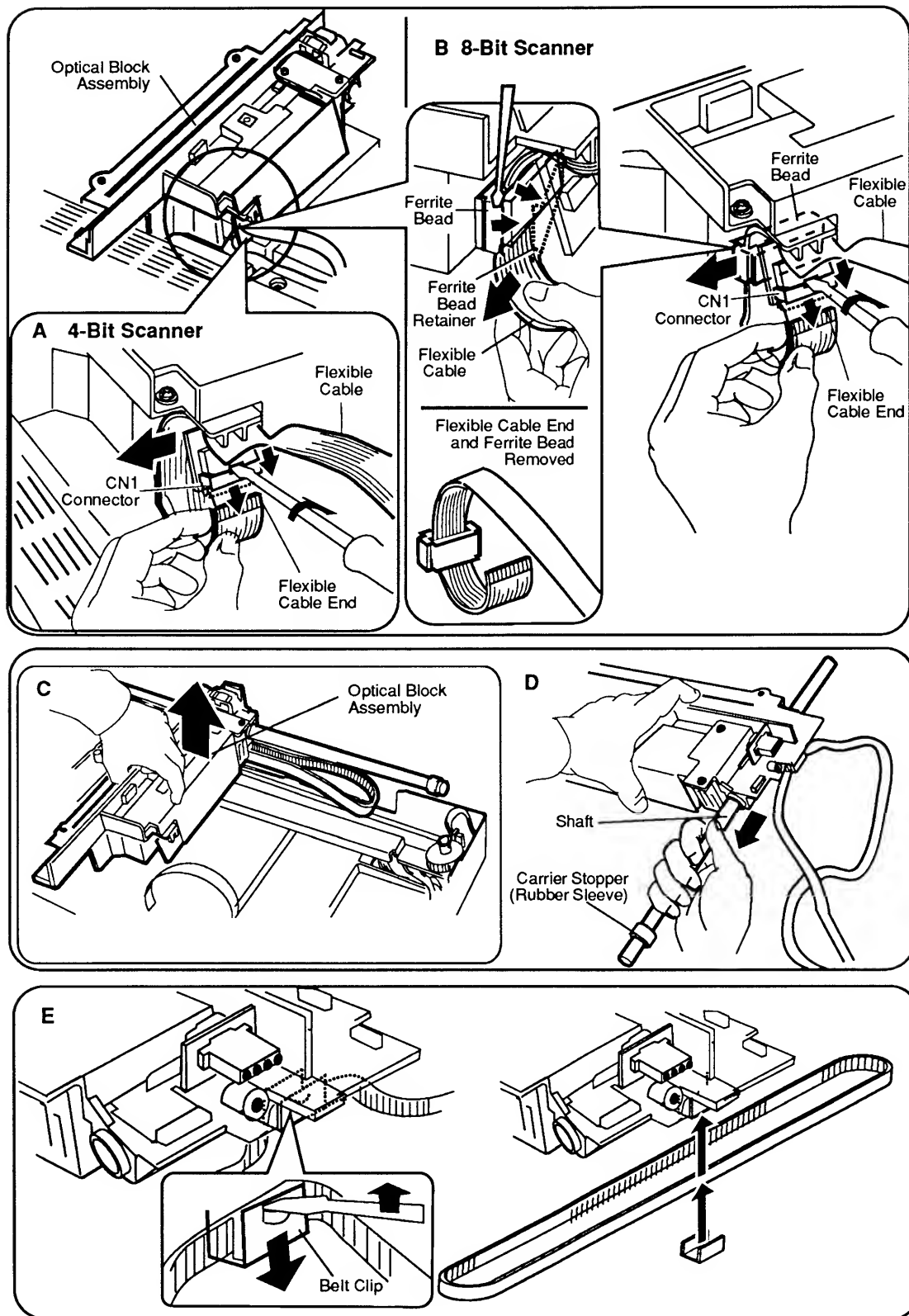
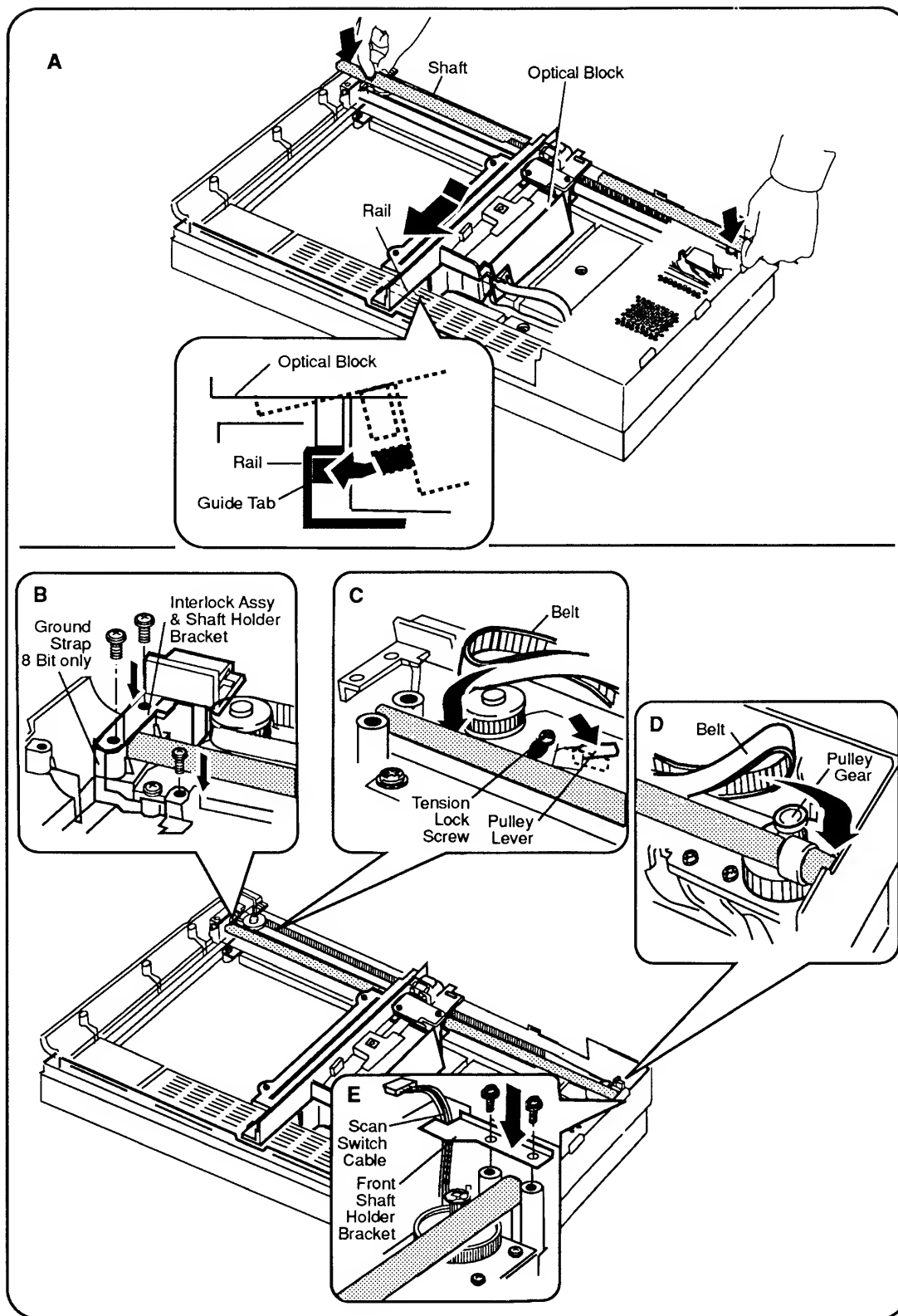


Figure 2-6 Flexible Ribbon Cable

5. Position the optical block across the center of the the scanner. Align the left side of the optical block with the cutout on the left-side rail.
6. **Figure 2-7A.** Slip the left side of the optical block under the left rail while making sure that the block engages under the rail.
7. **Figure 2-7B/E.** Lower the right side of the optical block into the scanner unit, making sure you fit the shaft into the shaft holders on both the front and back ends.
8. **Figure 2-7B/E.** Put the two shaft plates on each end of the shaft and secure them with the four screws. Make sure that the scan switch cable and connector are sticking out at the front corner of the front plate, so that the connector can be attached later to the case top.
9. **Figure 2-7D.** Connect the belt around the gear pulley at the front of the scanner.
10. **Figure 2-7C.** Connect the other end of the belt over the rear pulley. (If this pulley is not free so that you can easily install the belt, you will have to loosen the screw on the pulley bracket to allow the pulley to move.)
11. **Figure 2-7C.** Once the belt is on both pulleys, pull back on the rear pulley to increase the tension on the belt, and tighten the screw on the rear pulley bracket.
12. Put the front plate back on and secure the plate with two screws (see **Figure 2-4** if necessary).
13. Slide the light assembly onto the optical block, and push the assembly all the way in (see **Figure 2-3** if necessary).
14. Engage the light assembly electrical connector by screwing the Phillips screw all the way in. (This action pulls the two connectors together.)
15. Replace the case top and the lid.



**Figure 2-7 Flexible Ribbon Cable**

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## □ INVERTER ASSEMBLY

### Remove

1. Remove the lid, case top, and optical block.

**Note:** You do not have to remove the drive belt from the optical block in order to remove the inverter assembly.

2. The optical block cover is held in place by two catches. Slide a flat-blade screwdriver under one side of the optical block cover (as shown in **Figure 2-8A**) until you hear a snap. Repeat this step on the other side and set the cover aside.
3. Put the optical block on a flat surface.

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**CAUTION:** *In the middle top of the optical block is a Torx set screw (Figure 2-8A). This screw holds the CCD chips and mirror alignment. Do **not** attempt to loosen this screw. If the screw is loosened, you must replace the entire optical block.*

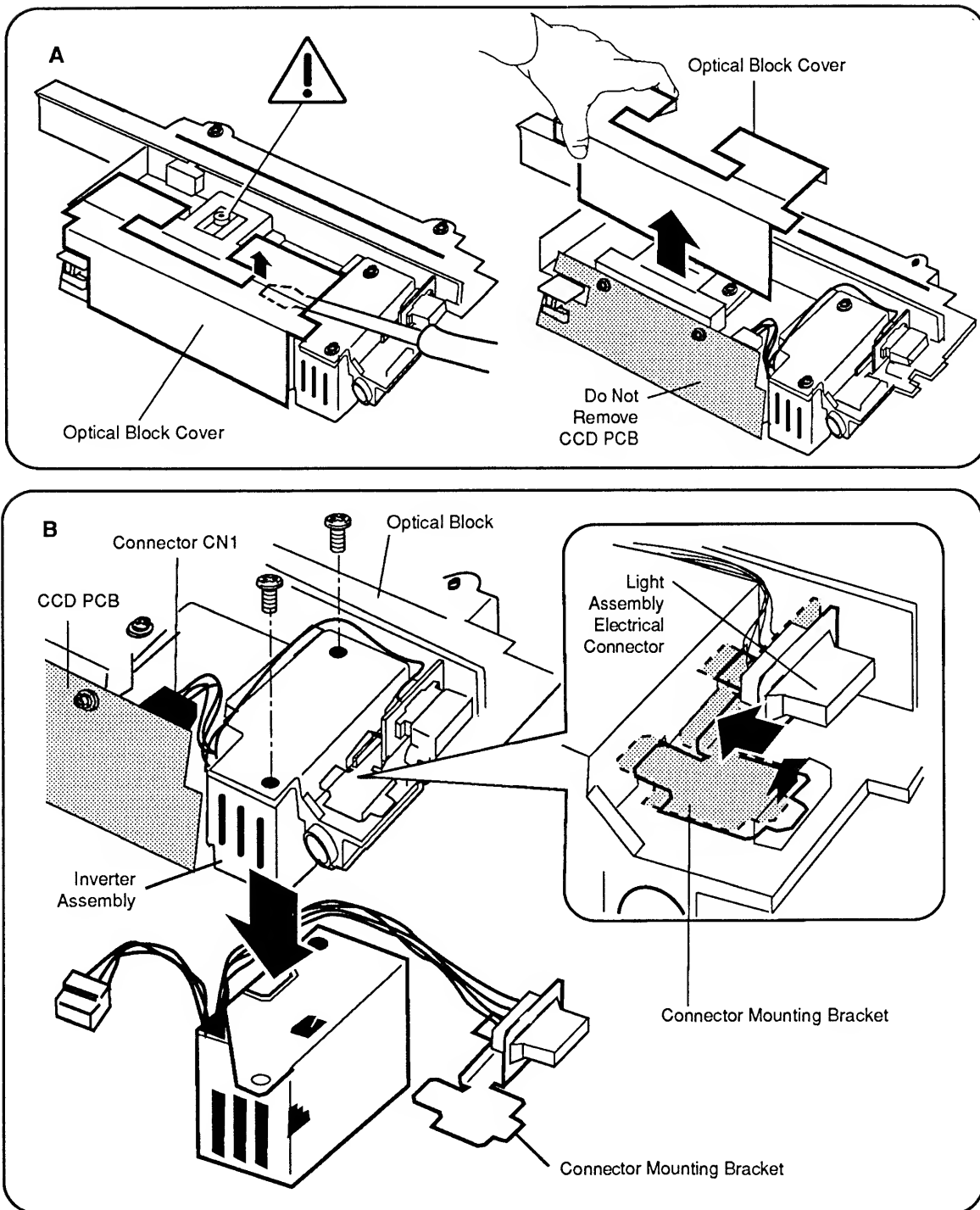
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4. **Figure 2-8B.** Unplug connector CN1 from the CCD PCB.
5. **Figure 2-8B.** Unscrew the two screws that hold the inverter assembly.
6. Lift up on the end of the optical block so that the inverter assembly dangles loosely.
7. Push the connector mounting bracket toward the inverter assembly and lift the bracket and light assembly electrical connector free.

### Replace

1. **Figure 2-8B.** Set the connector mounting bracket (with the light assembly electrical connector attached) in place.
2. **Figure 2-8B.** Install the inverter assembly and secure it with the two screws.
3. **Figure 2-8B.** Plug the connector into connector CN1 on the underside of the CCD PCB.
4. **Figure 2-8A/B.** Route the cables around the inverter assembly and under the cover. Align the optical block cover. Press down until it snaps into place.





**Figure 2-8 Inverter Assembly**

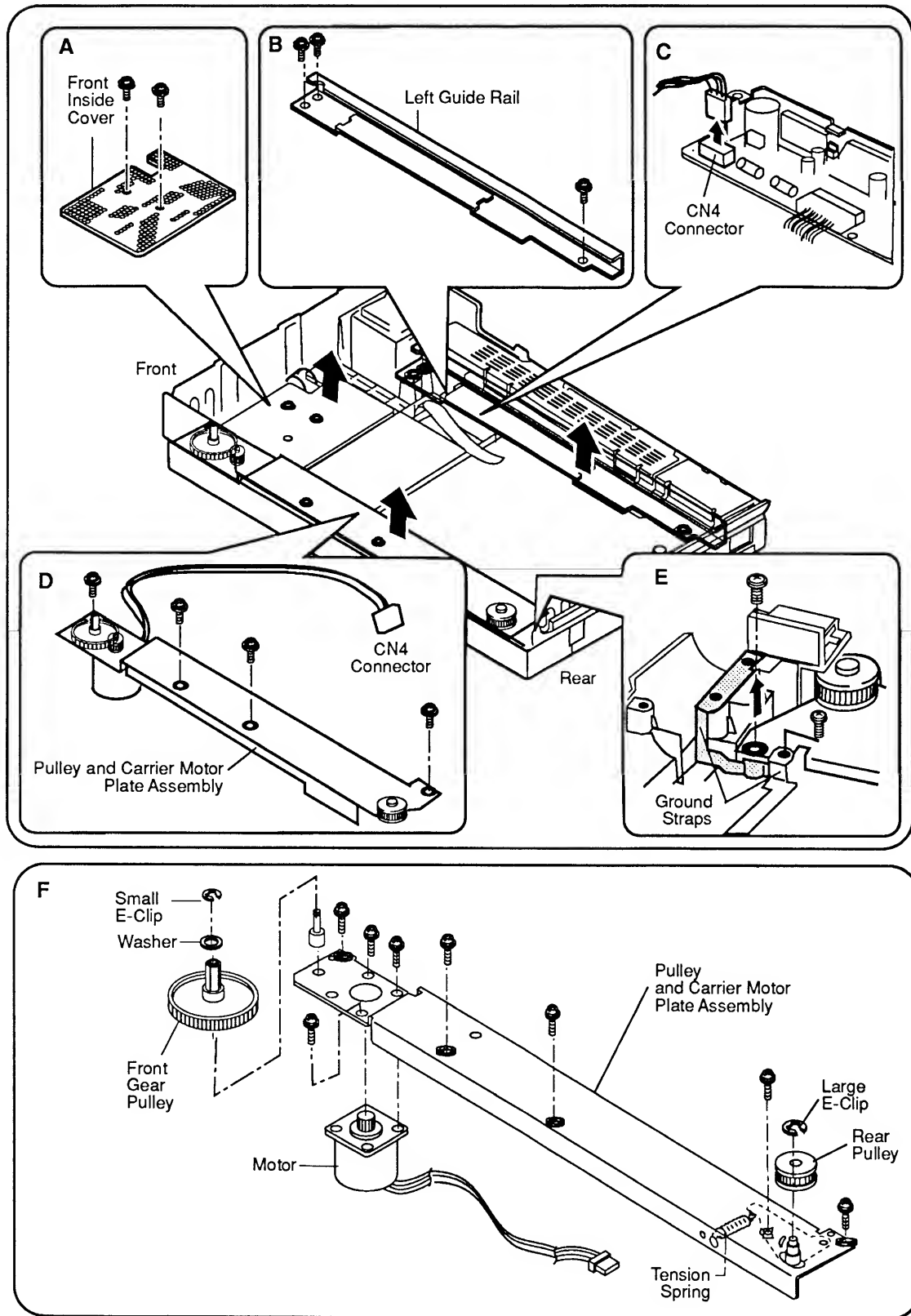
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## ❑ CARRIER MOTOR

### Remove

1. Remove the lid, case top, and scanning carrier assembly—optical block.
2. **Figure 2-9A.** Remove the two screws from the front inside cover, and remove the cover.
3. **Figure 2-9B.** Remove the left guide rail by removing the three screws that secure it to the case. This action allows you to access the power supply board.
4. **Figure 2-9D.** Remove the four screws with black washers on the pulley and carrier motor plate assembly.
5. **Figure 2-9E.** Locate the metal ground strap that comes from the left side of the case and is attached to the pulley and carrier motor plate assembly. Remove the screw.
6. **Figure 2-9C.** Disconnect CN4 from the power supply and release the cables from the cable clamp.
7. Carefully lift the pulley and carrier motor plate assembly out of the bottom case.
8. **Figure 2-9F.** Using a jeweler's screwdriver, remove the E-clip and washer from the gear pulley and pull off the gear pulley.
9. **Figure 2-9F.** Remove the three screws that hold the carrier motor to the carrier plate assembly and remove the motor.

**Note:** You can also remove the rear pulley at this time by removing the large E-clip and pulling off the pulley. Also, if the pulley tension spring needs to be replaced, you can reach it on the bottom of the pulley and carrier motor plate assembly.



**Figure 2-9 Carrier Motor**

## Replace

1. **Figure 2-10A.** Place the motor on the underside of the pulley and carrier motor plate assembly so that the wires face toward the front of the case. Attach the motor with the three screws. Tighten the screws.
2. **Figure 2-10A.** Place the gear pulley on its shaft and make sure that the gear on the pulley engages with the gear on the motor shaft.
3. **Figure 2-10A.** Replace the plastic washer flange-side-down on the gear pulley shaft, and secure the washer with the small E-clip.
4. **Figure 2-10A.** If you removed the rear pulley, replace it now. Reinstall the large E-clip.
5. Place the pulley and carrier motor plate assembly in the bottom case. Use the four screws with the black washers to secure the assembly. Make sure that the interlock switch assembly is loose but tucked in along the case.
6. **Figure 2-10B.** Connect the connector from the motor to CN4 on the power supply board. Guide the wires along the front bottom of the case and through the cable retainers.
7. **Figure 2-10C.** Replace the ground straps and secure them with screws.
8. **Figure 2-10D.** Replace the left guide rail and secure it with the three screws.
9. **Figure 2-10E.** Replace the front inside cover and secure it with two screws.
10. Replace the optical block, the case top, and the lid.

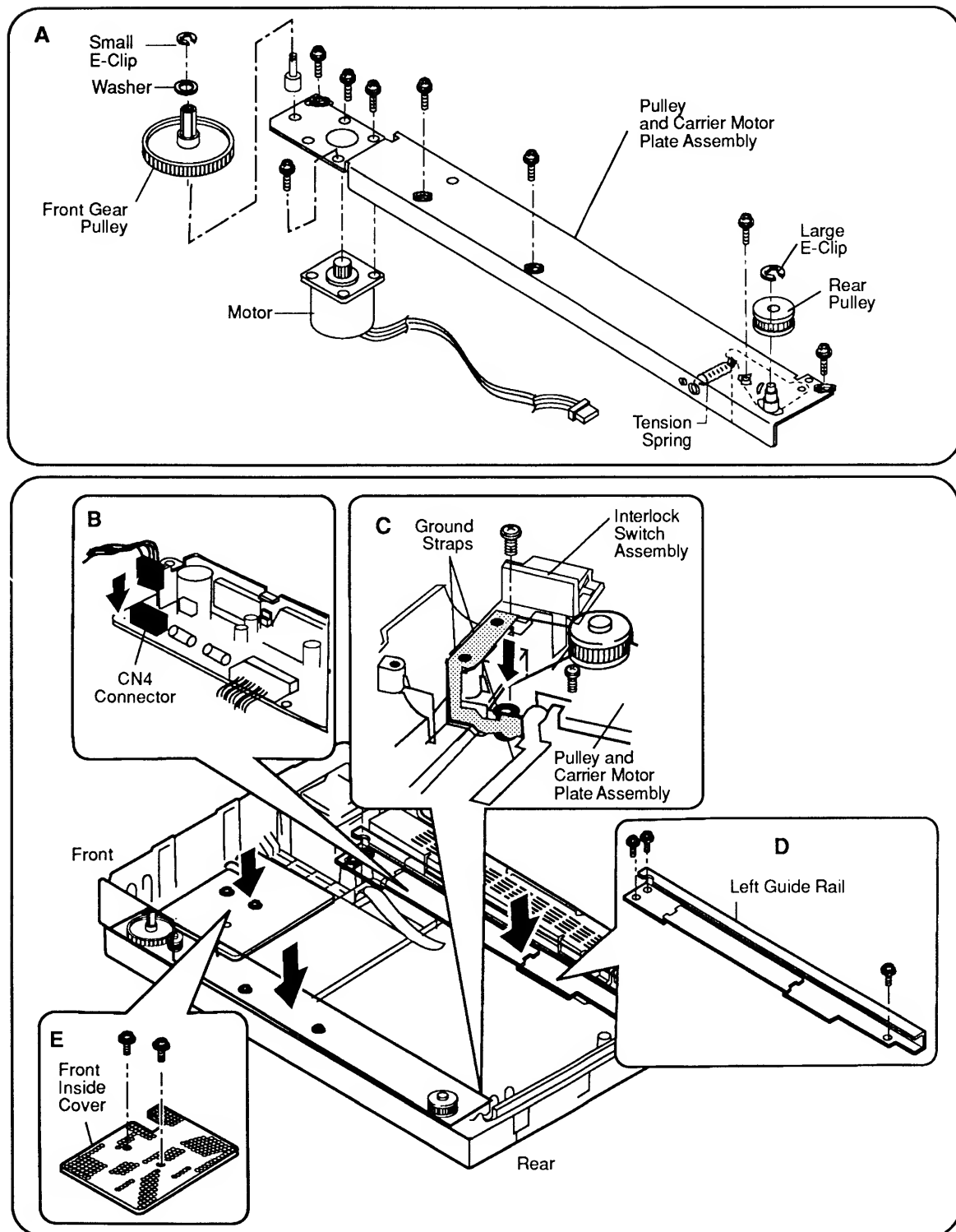


Figure 2-10 Carrier Motor

---

## ❑ TRANSFORMER

### Remove

1. Remove the lid, the case top, the optical block, and the carrier motor assembly.
2. **Figure 2-11A.** Unscrew the one screw from the black shield plate, and remove the plate by sliding it to the right side and then up.
3. **Figure 2-11A.** Remove connectors CN2 and CN5 from the power supply board.
4. **Figure 2-11A.** Remove the screws that secure the ground brackets.
5. **Figure 2-11B.** Remove the four screws from the mounting plate that holds the transformer to the bottom case.
6. **Figure 2-11B.** Pull out the transformer assembly along with the long wire that runs along the right side of the bottom case to the interlock switch. Undo the wires from the wire harness clips as needed.
7. **Figure 2-11A.** Remove the interlock switch assembly at the right rear of the scanner. Disconnect the two-wire connector from the interlock switch assembly. If you are replacing the transformer, this switch assembly is part of the transformer assembly.
8. **Figure 2-11D.** Unscrew the two mounting screws that hold the transformer to the mounting plate, and remove the transformer.

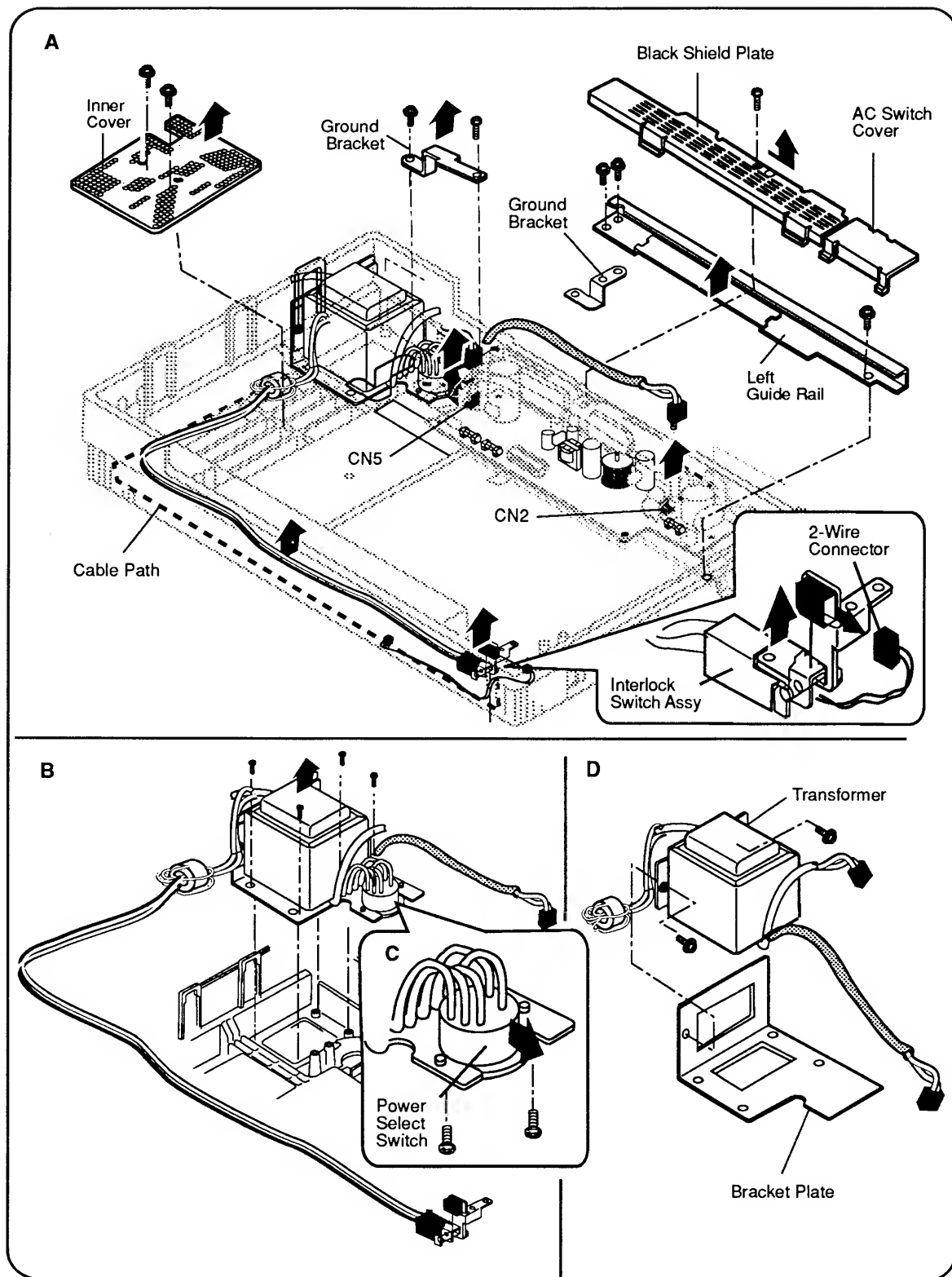
**Note:** On universal transformers, remove the power selector switch (**Figure 2-11C**) by removing the two Phillips screws that hold it in place.

### Replace

1. **Figure 2-11D.** Secure the transformer to the mounting plate using the two screws.

**Note:** On universal transformers, secure the power selector switch with the two Phillips screws.

2. **Figure 2-11B.** Using four screws, secure the transformer plate assembly to the bottom case.

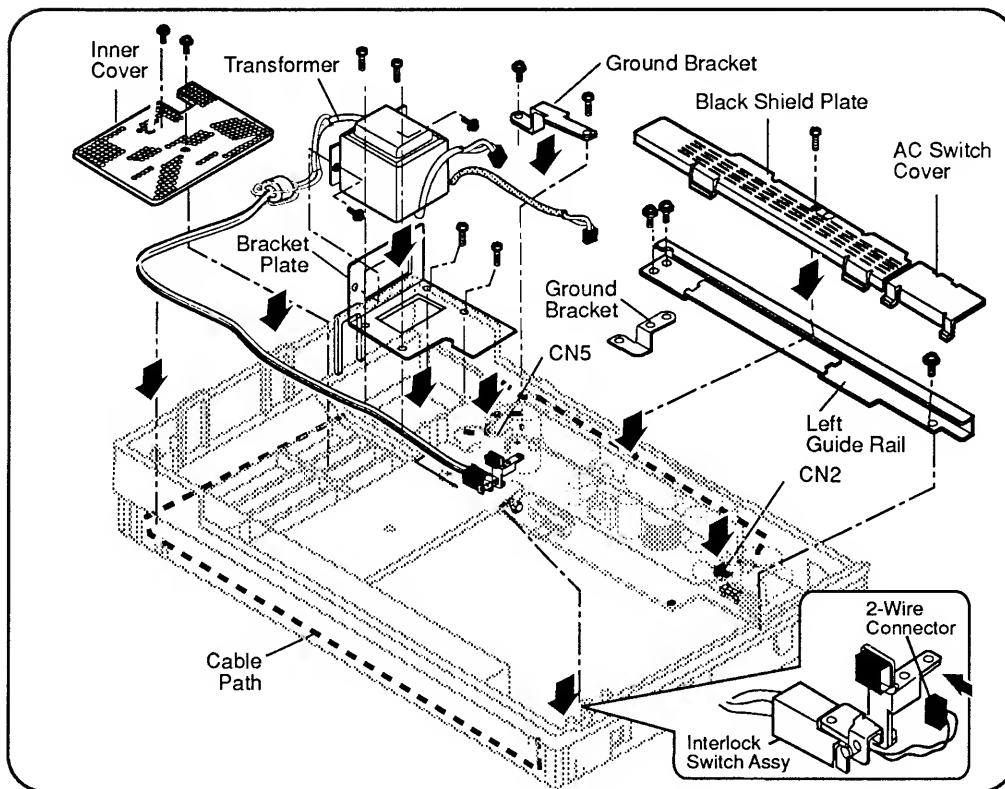


**Figure 2-11 Transformer**

3. Secure the ground brackets that connect the transformer mounting plate to the power supply board.
4. **Figure 2-12.** Run the set of long wires (attached to the interlock switch) across the front section of the bottom case and along the right side. Tuck the wires into the cable retainers. Reconnect the two-wire connector to the interlock switch.

If the interlock switch was removed from the bracket, attach the switch to the bottom side of the bracket using one screw. The switch button should face the side of the case.

5. **Figure 2-12.** Run the shielded wire along the left side of the case to CN2 on the power supply board. Connect CN5 and CN4 to the power supply board.
6. Replace the left guide rail, power supply shield, carrier motor, optical block, case top, and lid.



**Figure 2-12 Transformer**



## □ POWER SUPPLY PCB

### Remove

1. Remove the lid, the case top, and the scanning carrier assembly—optical block.
2. **Figure 2-13A.** Unscrew the one screw from the black shield plate and remove the plate by sliding it to the right side and then up.
3. **Figure 2-13B.** Disconnect the five connectors—CN1, CN2, CN3, CN4, and CN5—from the power supply board. (On the 8-bit scanner, you will need to remove the logic board, in its metal case, before you can disconnect CN3.)
4. **Figure 2-13B and C.** Remove the three self-tapping screws and the two machine screws that hold the power supply board to the housing. Remove the ground strap screw.
5. **Figure 2-13B.** Remove the ground strap bracket and remove the board.

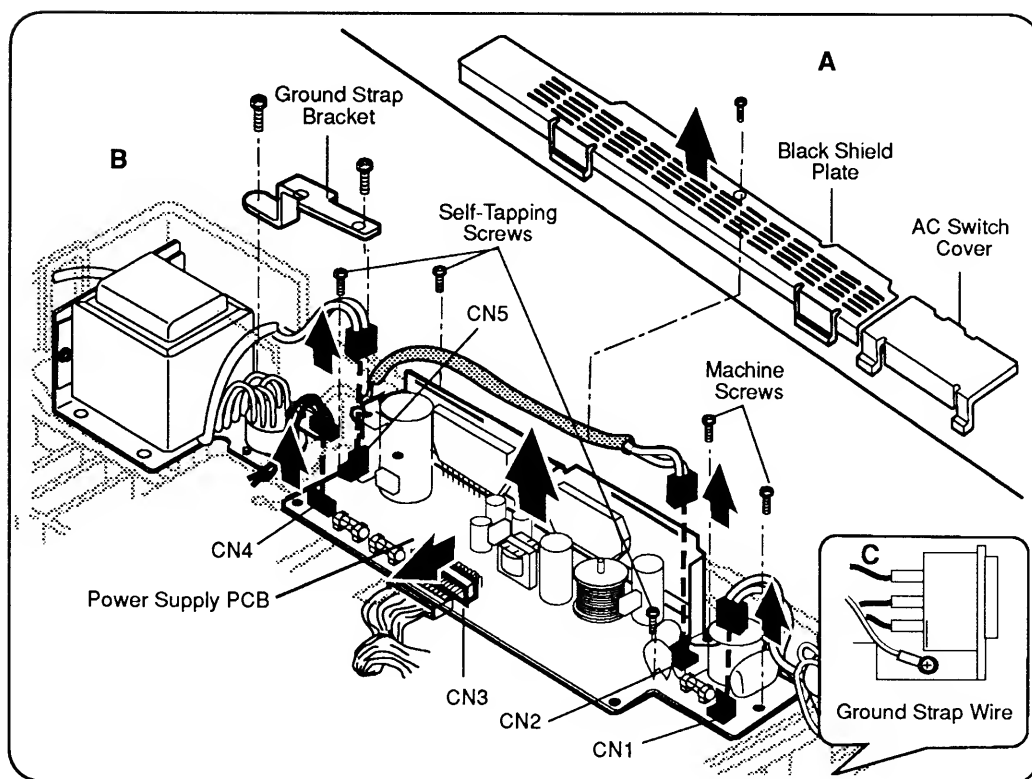


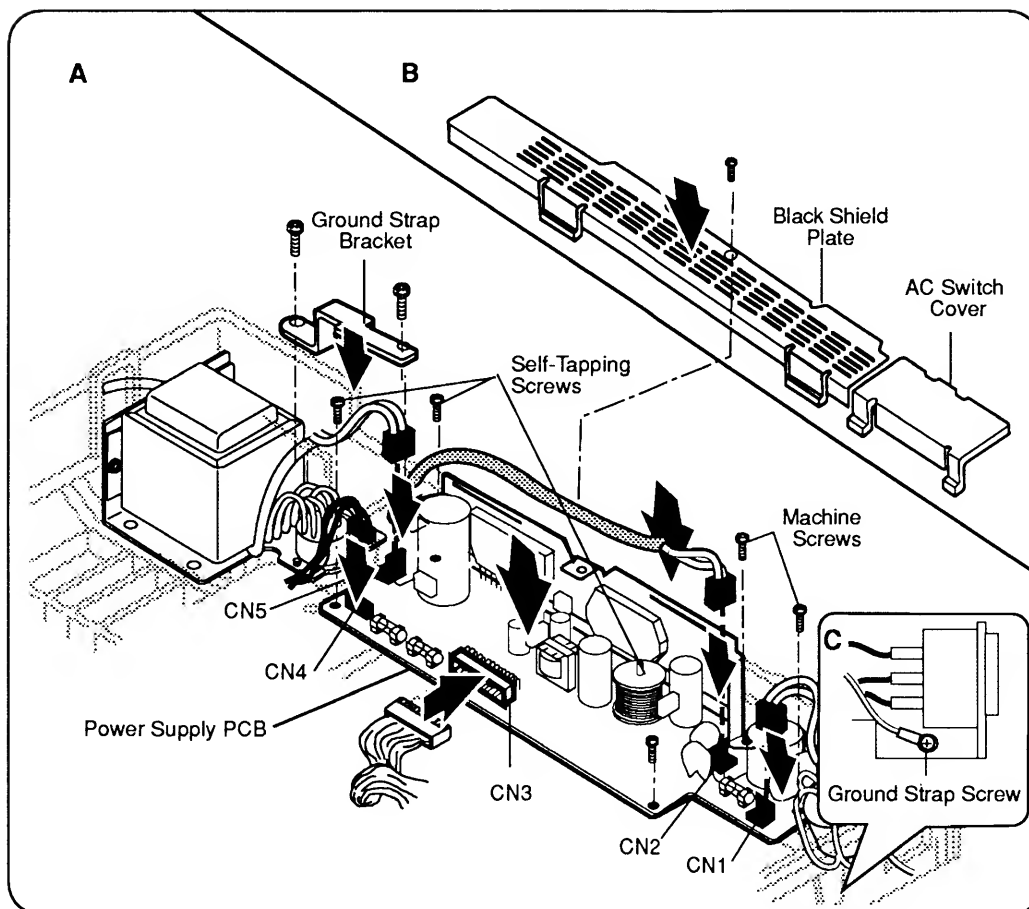
Figure 2-13 Power Supply PCB

## Replace

1. **Figure 2-14A.** Before installing the power supply board completely, align connector CN3 on the power supply board with the connector from the main logic PCB, and connect them.
2. **Figure 2-14A.** Place the power supply board in the case and secure it with the three self-tapping screws and the two machine screws.
3. **Figure 2-14A.** Connect the remaining four connectors—CN1, CN2, CN4, and CN5—to the power supply board.
4. **Figure 2-14A.** Connect the ground strap bracket from the transformer plate to the power supply board.

**Note:** If the transformer is out of the unit, do not replace the black shield plate or the left rail at this time; skip steps 5 and 6.

5. Replace the left-side guide rail with three screws.
6. **Figure 2-14B.** Replace the black shield plate and secure it with one screw.
7. Attach the AC switch cover. Make sure that the tabs snap into the slots on the left guide rail.
8. **Figure 2-14C.** Secure the ground strap with its screw.
9. Replace the carrier assembly, the case top, and the lid.



**Figure 2-14 Power Supply PCB**

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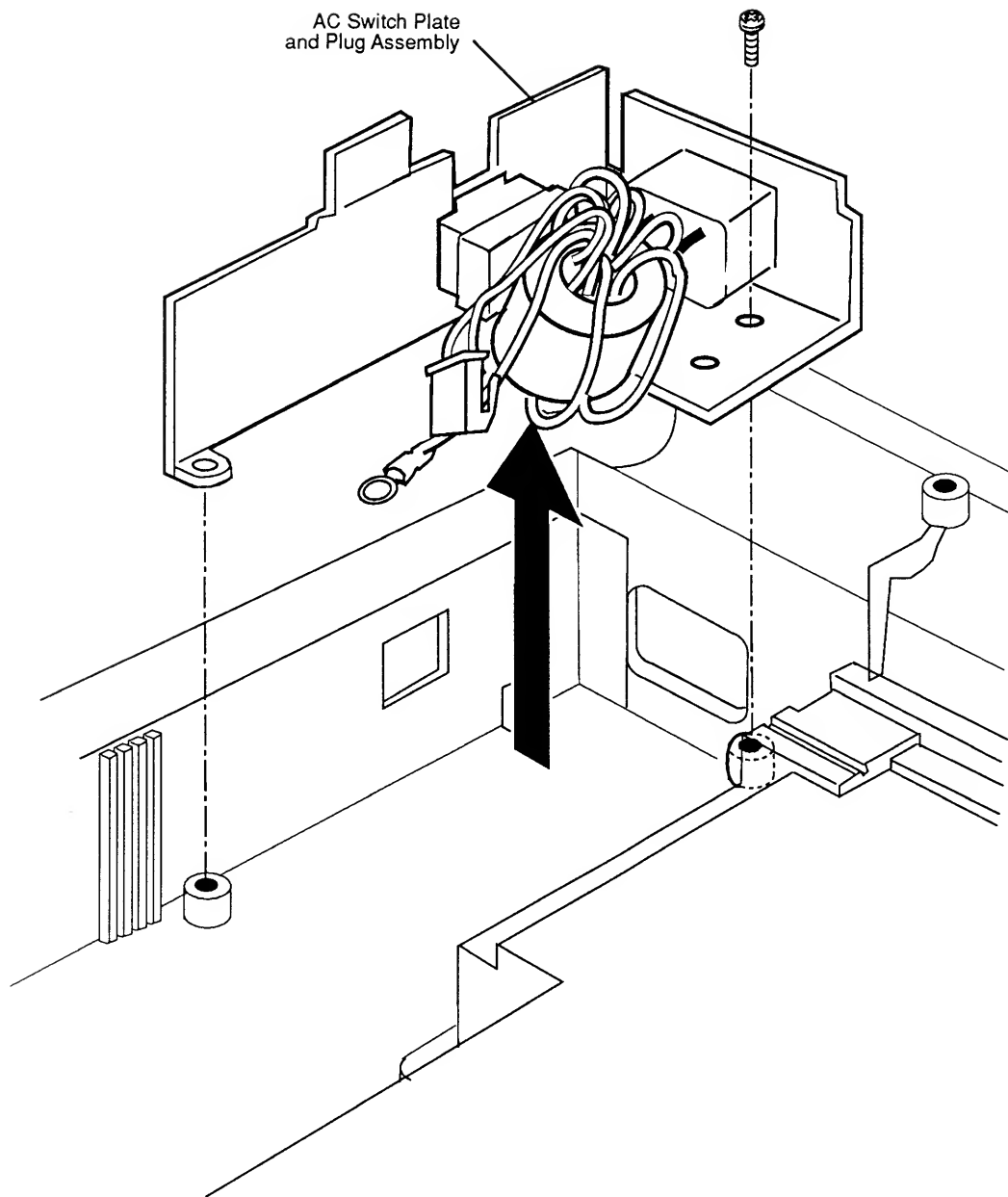
## □ AC SWITCH PLATE AND PLUG ASSEMBLY

### Remove

1. Remove the lid, the case top, and the power supply board.
2. **Figure 2-15.** Remove the one screw that holds the AC switch plate and plug assembly to the case.
3. **Figure 2-15.** Remove the switch plate and plug assembly.

### Replace

1. **Figure 2-15.** Replace the switch plate assembly on the case and secure it with the one screw.
2. Replace the power supply board, the case top, and the lid.



**Figure 2-15 AC Switch Plate and Plug Assembly**

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## □ MAIN LOGIC PCB

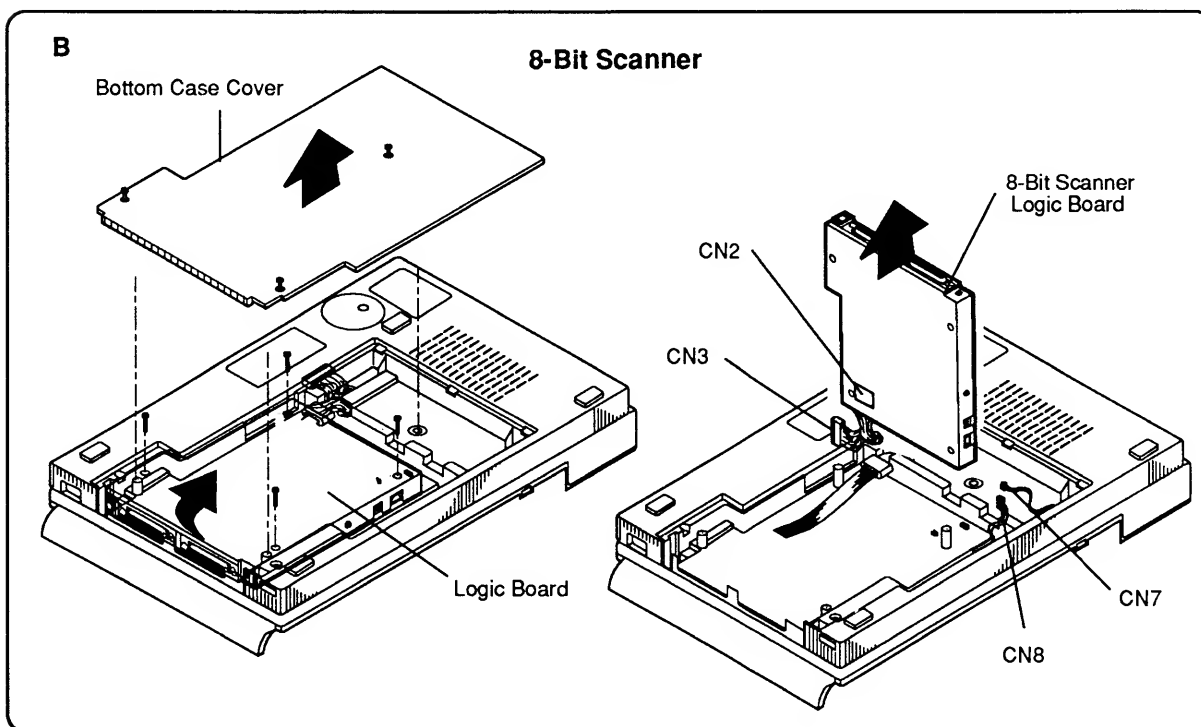
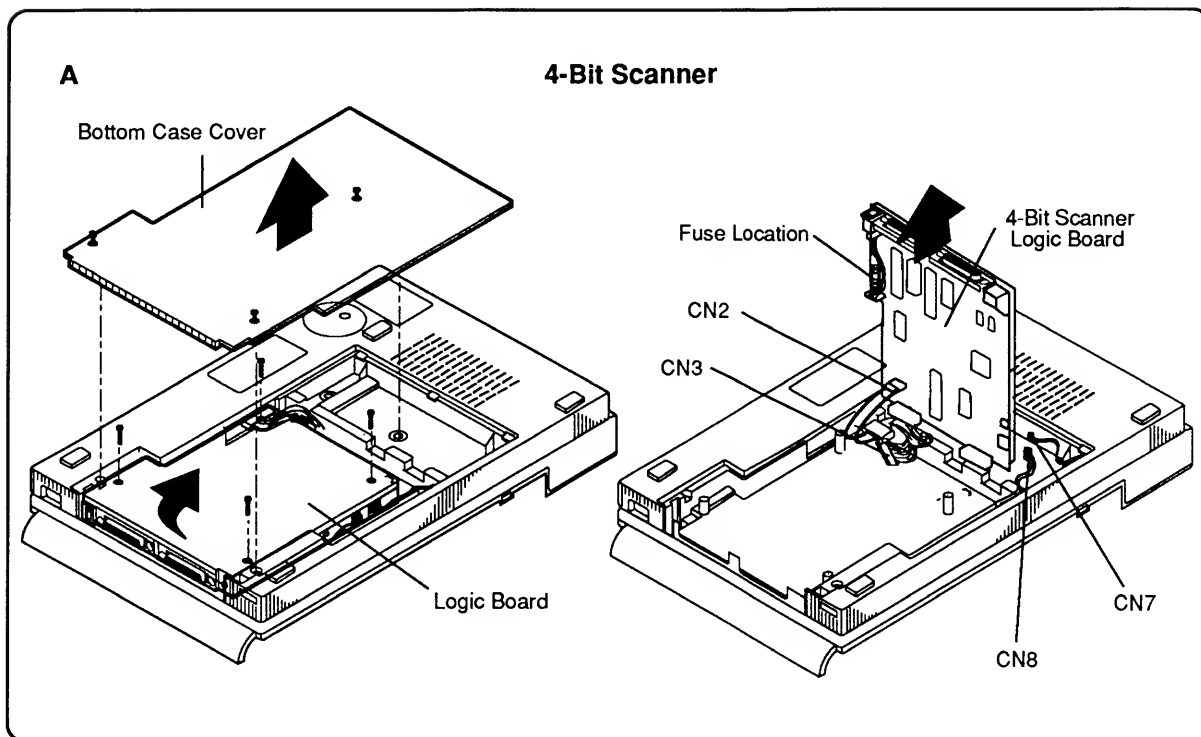
### Remove

1. Stand the scanner on its left side.
2. **Figure 2-16A/B.** Loosen the three screws on the bottom panel. (The screws will not come out, but make sure they are loosened all the way.) The panel will come off.
3. 4-bit scanner: **Figure 2-16A.** Remove the four screws that hold the PCB to the scanner bottom. Once the screws are removed, the board will be loose and you can pull it out easily. Before pulling the board all the way out, reach around and remove the four connectors—CN2, CN3, CN7, and CN8

8-bit scanner: **Figure 2-16B.** Remove the four screws that hold the PCB case to the scanner bottom. Once the screws are removed, the board will be loose and you can pull it out easily. Before pulling the board all the way out, reach around and remove the connectors. Do not remove the 8-bit PCB from the metal case.

### Replace

1. Attach the cables to connectors CN2, CN3, CN7, and CN8 (**Figure 2-16A/B**).
2. Align the four screw holes on the corners of the board with the four holes on the case.
3. Install the four screws.
4. Use the three screws to install the bottom panel.



**Figure 2-16 Main Logic PCB**

1

2

3



# Apple Scanner

## Section 3 – Diagnostics

---

### □ CONTENTS

3.2	Introduction
3.4	Test Descriptions
3.4	ScanTest (4-Bit Scanner)
3.5	Scan8Test (8-Bit Scanner)
3.6	Using ScanTest
3.6	Helpful Hints
3.7	Procedure
3.11	Immediate Mode
3.11	Startup Screen
3.11	Configuration (4-Bit Scanner)
3.12	Configuration (8-Bit Scanner)

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## □ INTRODUCTION

*ScanTest*® 4.4 (for the 4-bit scanner) and *Scan8Test* (for the 8-bit scanner) are diagnostic programs that verify whether the scanner is working correctly. These diagnostics provide the following tests:

<i>ScanTest</i> (4-bit scanner)	<i>Scan8Test</i> (8-bit scanner)
Self-Test	Self-Test
Accuracy Test	Accuracy Test
Image Greyscale Test	Repeatability Test
Image Resolution Test	Image Greyscale Test
	Resolution Test

To run the diagnostic, you must use the *Apple Scanner Service Test Chart*. The chart is shown in Figure 3-1.

Before using the test chart, examine the chart for the following conditions, any of which could cause a test to fail:

- There should be no folds, bends, or scratches anywhere on the chart.
- The chart should be completely clean—no smudges, spots, or stains.

If it becomes necessary to clean the test chart, use only a clean and dry lint-free cloth. **Do not** use any solvents or cleansers as these could ruin the test chart.

When the test chart is not in use, it should not be exposed to sunlight or any source of ultraviolet light. To protect the chart from dirt and other possible damage, store it in its supplied protective folder and envelope or other flat container.

**Note:** You can run the diagnostic from the diagnostic disk or from a hard disk. If you run the diagnostic from a hard disk, make sure that you use Macintosh system software 6.0.5 through 6.0.7 for the 4-bit scanner, or Macintosh system software 6.0.7 for the 8-bit scanner. (Do not run the diagnostic with System 7.)

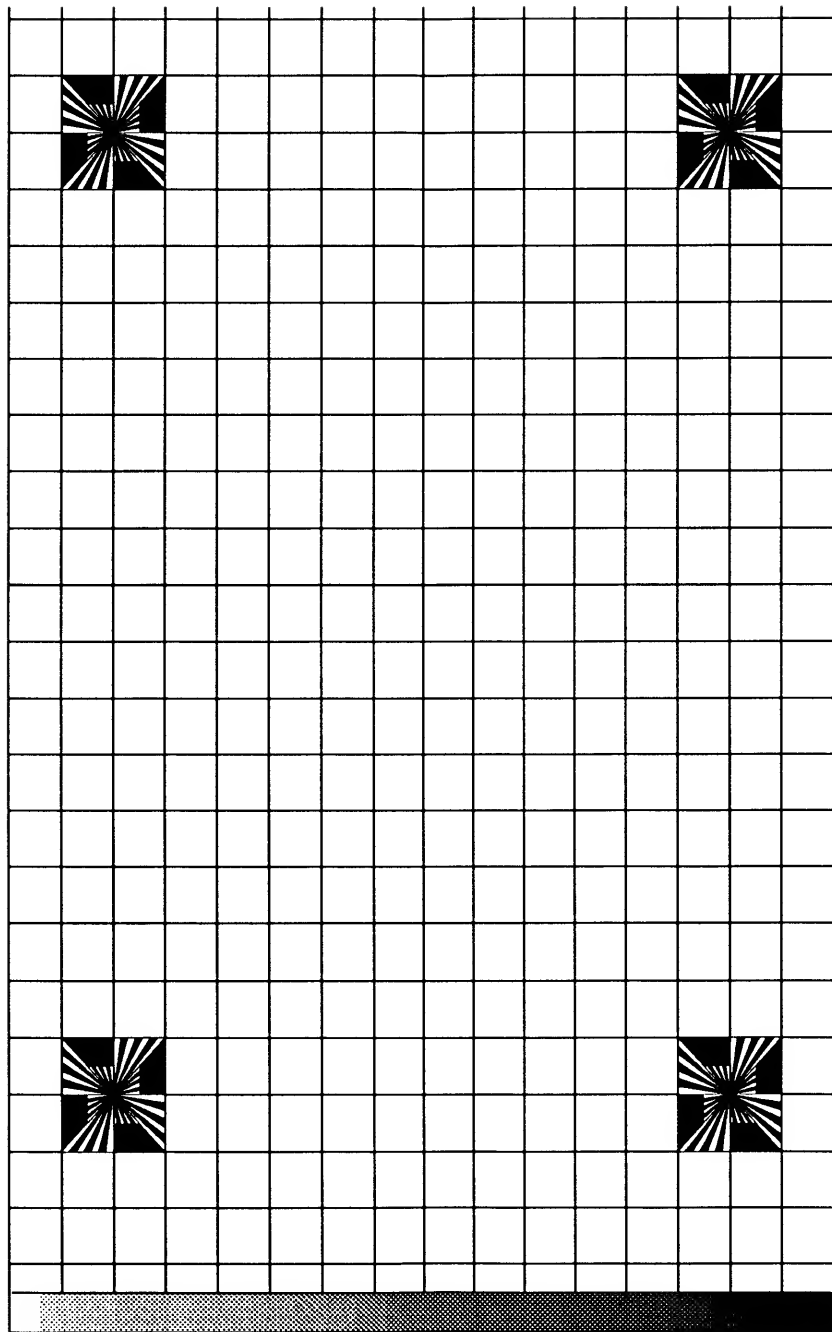


Figure 3-1 Test Chart

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## □ TEST DESCRIPTIONS

### **ScanTest (4-Bit Scanner)**

The following is a brief description of the tests available in *ScanTest*. All tests except the self-test are user-selectable.

### *Self-Test*

The self-test runs automatically everytime you run *ScanTest*. The built-in self-test includes the following:

- ROM test
- RAM tests
- Lamp tests (checks for no light or dim light)
- Home position test (detects optical block in home position)
- Shade error test (tests for shading errors)
- CPU port, DIP, DMA, and GA1 and GA2 component tests
- Limit switch test

### *Accuracy Test*

In the accuracy test, the scanner scans the test chart for reference points and creates a table based on these points. The test then compares the actual intersection points against this table. If the intersection points deviate from the table specifications, the test fails. Next, the scanner scans the test chart again and compares the first set of data with the data from the second scan. The data from both scans should be identical (meaning that the intersections from one scan should be the same as those from the second scan). Otherwise, the test fails.

### *Image Greyscale Test*

This test uses the gray-scale strip at the bottom of the test chart. The strip has 37 zones of gray. Each zone has a value. When the scanner scans the strip, the test compares the values to preset values. A deviation of  $\pm 1$  gray scales fails the test.

### *Image Resolution Test*

The image resolution test uses the upper-left and lower-right targets on the test chart. The test is the same for each target. The test detects the top, bottom, left, and right edges of the wedge and then counts the pixels from the center of the target to the edge. The software calculates a pixel average and applies a formula to calculate the resolution. If the resolution is not within specifications, the test fails.

## **Scan8Test (8-Bit Scanner)**

The following is a brief description of the tests available in *Scan8Test*. All tests are user-selectable.

### *Self-Test*

The self-test includes the following:

- ROM test
- RAM tests (tests correction RAM, buffer RAM, and scanner RAM)
- Lamp tests (checks for no light or dim light)
- Home position test (detects optical block in home position)
- Limit switch test (detects whether scanner can locate the limit switch position)
- CPU component tests
- CCDCG test (tests the CCD SCSI clock generator)

### *Accuracy Test*

In the accuracy test, the scanner scans the test chart for reference points and creates a table based on these points. The test then compares the actual intersection points against this table. If the intersection points deviate from the table specifications, the test fails.

### *Repeatability Test*

In the repeatability test, the scanner scans the test chart twice and compares the first set of data with the data from the second scan. The data from both scans should be identical (meaning that the intersections from one scan should be the same as those from the second scan). Otherwise, the test fails.

### *Greyscale Test*

This test uses the gray-scale strip at the bottom of the test chart. The strip has 37 zones of gray. Each zone has a value. When the scanner scans the strip, the test compares the values to preset values. A deviation of  $\pm 1$  gray scales fails the test.

### *Resolution Test*

The image resolution test uses the upper-left and lower-right targets on the test chart. The test is the same for each target. The test detects the top, bottom, left, and right edges of the wedge and then counts the pixels from the center of the target to the edge. The software calculates a pixel average and applies a formula to calculate the resolution. If the resolution is not within specifications, the test fails.

---

## □ USING SCANTEST

### Materials Required

*ScanTest* 4.4 diagnostic program (for 4-bit scanner)  
*Scan8Test* diagnostic program (for 8-bit scanner)  
Apple Scanner Service Test Chart

---

**IMPORTANT:** *Before you run the diagnostic, you must check for the following conditions:*

- *The scanner must be attached correctly to the computer through the SCSI connector. The power cord must be plugged in and the power switched on.*
- *The scanner glass must be completely clean, outside and inside.*
- *There must be no debris between the scanner glass and the test chart.*
- *The test chart must be placed face-down on the scanner window, with the black strip along the rear edge of the window and the edge of the chart against the right edge of the scanner glass (see Figure 3-2).*
- *The scanner SCSI address must not be set to 7 or to the address of any other device connected to the SCSI bus.*
- *The SCSI bus must be properly terminated. If you need assistance, refer to the Apple SCSI Cable System manual.*

*Failure to meet these conditions will cause the diagnostic tests to fail and may give you false information about the scanner.*

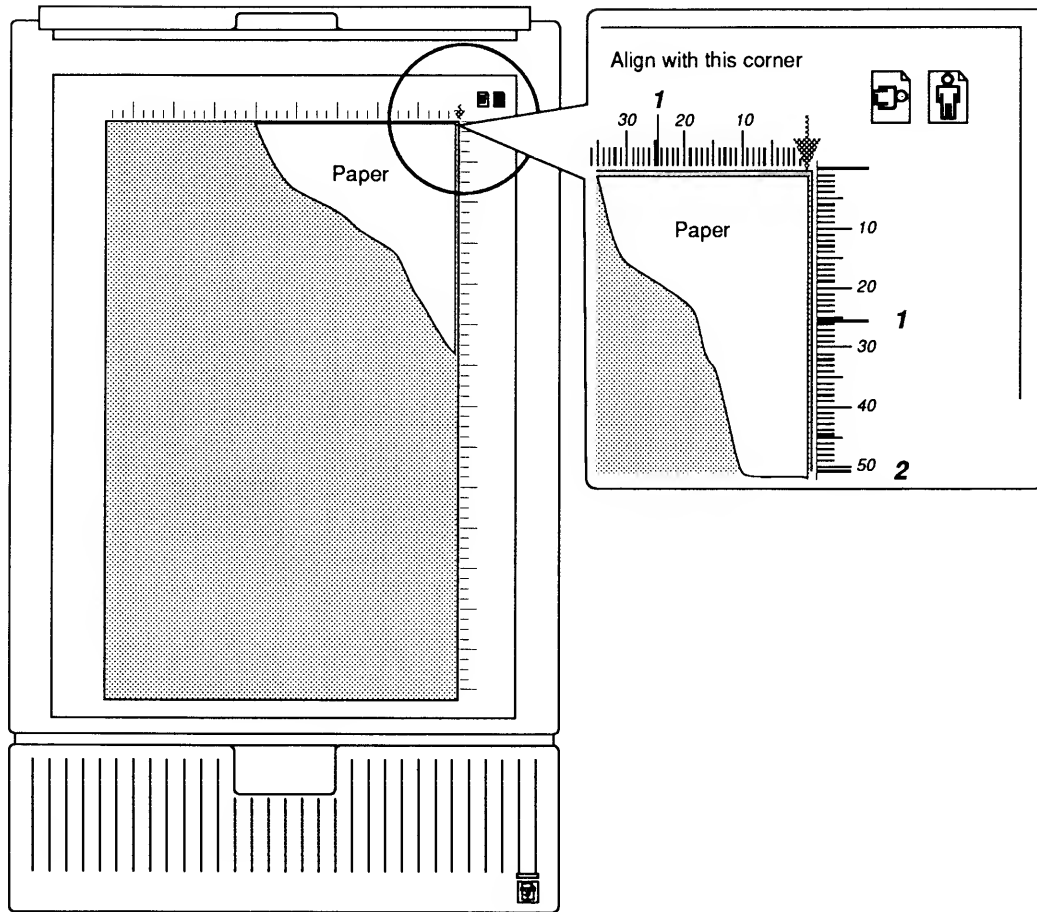
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### Helpful Hints

- You can run the diagnostic from the diagnostic disk or from a hard disk. If you run the diagnostic from a hard disk, make sure that you use Macintosh system software 6.0.5 through 6.0.7 for the 4-bit scanner, or Macintosh system software 6.0.7 for the 8-bit scanner. (Do not run the diagnostic with System 7.0 software.)
- Turn MultiFinder® off before running the diagnostic.

## Procedure

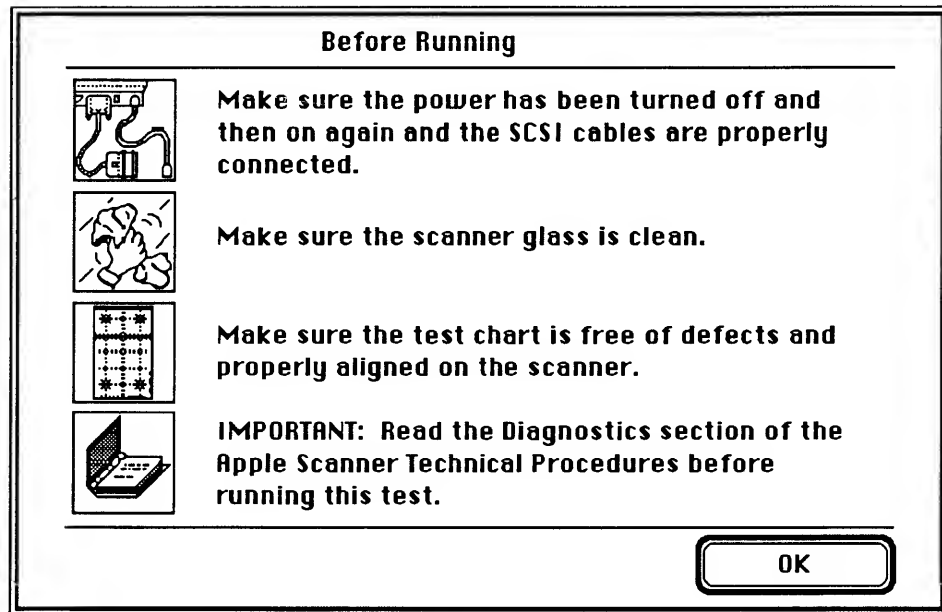
1. Align the test chart with the upper-right corner of the scanner as shown in Figure 3-2.



**Figure 3-2 Placing the Test Chart on the Scanner**

2. Carefully close the lid without moving the test chart.

3. Double-click on the diagnostic (*ScanTest* or *Scan8Test*) application icon. If the startup screen is not disabled, the screen shown in Figure 3-3 appears. (Refer to "Startup Screen" later in this section.) This information window reminds you of conditions that must be present for the diagnostic to run correctly.

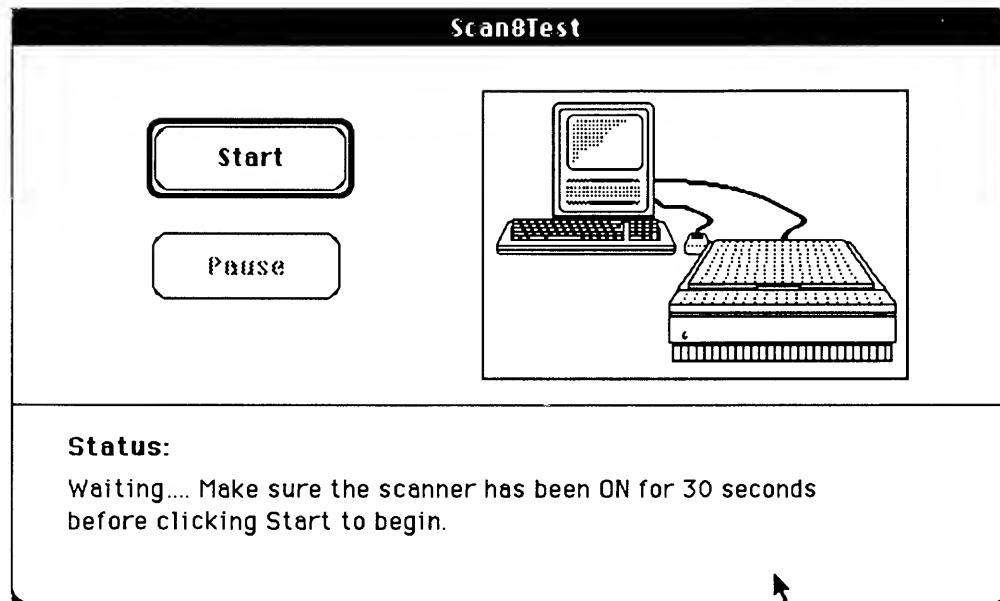


**Figure 3-3 Startup Screen**

**Note:** The art in this section depicts *Scan8Test* screens. *ScanTest* screens will vary slightly.



4. When you have read the screen and made sure these conditions are correct, click **OK**. The status screen (shown in Figure 3-4) appears.



**Figure 3-4 Status Screen**

5. Pull down the Options menu and select **Test Selections**, or hold down the <Command> key while typing **T**.
6. The test selection window (Figure 3-5) appears. You can select any of the tests—one at a time or in any combination.

**Note:** *ScanTest* lists three test selections, while *Scan8Test* lists the five tests shown in Figure 3-5.

7. Select the tests you want to run by clicking in the box next to the test. When you have selected all the tests you want, click **OK**.

**Note:** Once you have selected the tests you want to run, you can set these tests to run whenever you start the diagnostic. To set tests, select **Save Test Selections** from the Edit menu. You will still have the option to change your selection whenever you want by redoing steps 5, 6, and 7.

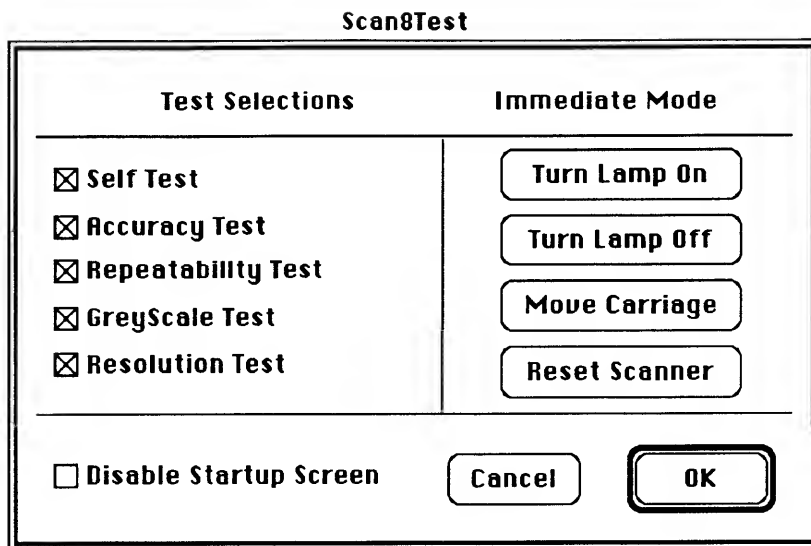


Figure 3-5 Test Selection Window

8. Click the Start button to begin the tests. If any test fails, the diagnostic stops and gives you an information window as shown in Figure 3-6.

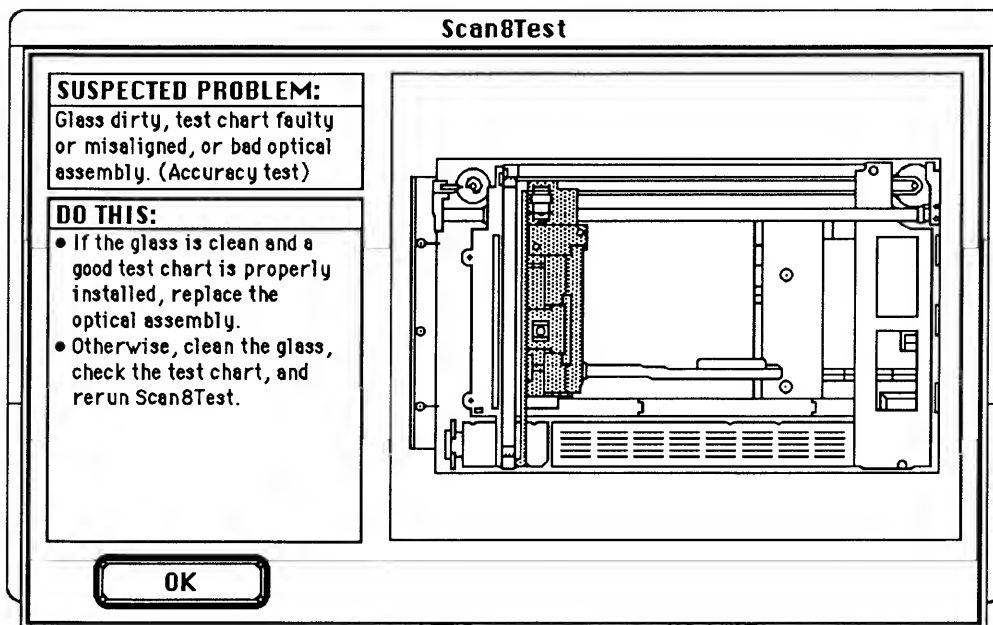


Figure 3-6 Sample Information Window

## Immediate Mode

The diagnostic provides an **immediate mode** to reset the scanner, control the movement of the carriage, and turn the lamp on and off.

Select the functions you want by clicking on the appropriate button at the right side of the test selections window.

## Startup Screen

The startup screen displays setup information important to obtaining good results with the diagnostic. If you do not want the startup screen displayed each time you run the diagnostic, select **Disable Startup Screen**.

## Configuration (4-Bit Scanner)

The Configuration selection in *ScanTest* displays the following information that can aid you in troubleshooting the 4-bit scanner:

- **Vendor ID** – Identifies Apple as the manufacturer
- **Product ID** – Displays the scanner model number
- **Revision** – Displays the version of the firmware
- **SCSI Port** – Displays the SCSI device address for the scanner

You can display additional self-test information by clicking on the Additional Info button at the bottom of the Configuration window. This information provides additional detail as to the nature of a failure.

## Configuration (8-Bit Scanner)

The Configuration selection in *Scan8Test* displays the following information that can aid you in troubleshooting the 8-bit scanner:

- **Vendor ID** – Identifies Apple as the manufacturer
- **Product ID** – Displays the scanner model number
- **Revision** – Displays the version of the firmware
- **SCSI Port** – Displays the SCSI device address for the scanner
- **Type** – Identifies whether the scanner is 4-bit or 8-bit
- **System RAM** – Displays the size of the scanner memory
- **Buffer RAM** – Displays the size of the buffer memory
- **C RAM** – Displays the size of the correction memory
- **System ROM** – Displays the size of the scanner ROM

# Apple Scanner

## Section 4 – Troubleshooting

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### □ CONTENTS

- 4.2 Running Self-Test
- 4.2 Self-Test Results
- 4.3 Symptom/Cure Chart

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## ❑ RUNNING SELF-TEST

The Apple Scanner has built-in self-test diagnostics that test the following functions of the scanner:

### 4-Bit Scanner

Fluorescent lamp  
Limit switch searching  
Home position searching  
ROM  
RAM  
CPU port  
SCSI controller  
Digital image preprocessor  
DMA controller  
Gate array 1  
Gate array 2  
Shading check

### 8-Bit Scanner

Fluorescent lamp  
Limit switch searching  
Home position searching  
ROM  
RAM (scanner, correction,  
and buffer RAM)  
CPU port  
SCSI controller  
CCDCG

You can activate the self-test in two ways: 1) switch on the scanner while holding down the Start Scan button (hardware method) or 2) run the *ScanTest* or *Scan8Test* diagnostic. Section 3, Diagnostics, contains directions for running the diagnostic.

### Self-Test Results

To see the results of the self-test, you must have the *AppleScan*, *ScanTest*, or *Scan8Test* application running when you start the self-test.

If the application (*AppleScan*, *ScanTest*, or *Scan8Test*) is running on a Macintosh computer that is connected to the scanner and one of the self-test functions fails, a dialog box displays on the monitor screen and indicates what part of the self-test failed.

If you run the self-test when the scanner is not connected to a Macintosh computer running *AppleScan*, *ScanTest*, or *Scan8Test*, you will not obtain results for the test.

---

## □ SYMPTOM / CURE CHART

Problems	Solutions
<ul style="list-style-type: none"><li>• <i>Power lamp not on; machine dead</i></li></ul>	<ol style="list-style-type: none"><li>1. Check that the power cord is plugged in.</li><li>2. Check that the light assembly access door is closed and turned fully clockwise.</li><li>3. Check for correct setting of the voltage selector (on universal models).</li><li>4. Check the interlock switch with a multimeter and replace if the switch is not opening and closing when depressed.</li><li>5. Check fuses FU1, FU2, and FU3 on the power supply board and replace any that are blown.</li><li>6. (4-bit scanner only) Check fuse 1 on the main logic board. Replace the fuse if it is bad.</li><li>7. Replace the main logic board.</li><li>8. Replace the power supply.</li><li>9. Replace the transformer.</li></ol>
<ul style="list-style-type: none"><li>• <i>Optical assembly does not move</i></li></ul>	<ol style="list-style-type: none"><li>1. Check for damage or foreign matter on the belt, and clean or replace the belt if necessary.</li><li>2. Check the belt tension. The belt should be tight with no slack. Correct the tension if necessary.</li><li>3. Check the gears for damage or buildup of foreign material, and remove the blockage or replace the gears as necessary.</li></ol>
<ul style="list-style-type: none"><li>• <i>Optical assembly moves once, then does not move</i></li></ul>	<ul style="list-style-type: none"><li>– Check the limit switch for continuity, and replace if necessary.</li></ul>
<ul style="list-style-type: none"><li>• <i>System does not boot or locks up during transfer of data over the SCSI bus</i></li></ul>	<ul style="list-style-type: none"><li>– (4-bit scanner only) Perform the "Main Logic Board Modification" described in Section 5, Additional Procedures.</li></ul>
<ul style="list-style-type: none"><li>• <i>AppleScan program crashes during middle of scanning operation, or computer hangs</i></li></ul>	<ol style="list-style-type: none"><li>1. Make sure you have the latest version of <i>AppleScan</i>.</li><li>2. Replace the power supply PCB.</li><li>3. Replace the main logic board.</li></ol>

- *Fluorescent lamp won't light or is dim*
  1. Check that the lamp holder connector is secure.
  2. Check that the label of the fluorescent lamp faces down (into the lamp holder); if not, rotate the lamp.
  3. Replace the lamp.
  4. Check the flexible cable from the optical unit for damage, and replace the cable if necessary. Check the continuity of the cable with an ohmmeter; replace the cable if any wires are broken.
  5. Replace the inverter (or optical head).
  
- *Scan command not executed*
  1. Check for secure connection of cable from host computer.
  2. Reset the SCSI select switch on the scanner to a device number not used. (Factory preset at 2.) Do not use 7 or 8.
  3. Verify that the SCSI cable is terminated correctly.
  4. (4-bit scanner only) Check the fuse on the main logic board. Replace the fuse if it is bad.
  5. Replace the main logic board.
  
- *Image not clean; dark or light spots*
  1. Clean the glass (see "Preventive Maintenance" in the Basics section).
  2. If the contrast or threshold in the *AppleScan* program is set too high or low, adjust the program settings.
  3. Replace the lamp.
  4. Replace the main logic board.
  5. Replace the optical assembly.
  
- *Scanning performed, but image is not sent to host computer*
  1. Check for loose or damaged interface connector, and repair or replace as necessary.
  2. Replace the optical assembly.
  3. Check the fuse on the main logic board. Replace the fuse if it is blown.
  4. Replace the main logic board.
  
- *Incorrect image on host screen*
  - Use the test chart. If image is incorrect, clean the glass first; if cleaning does not help, change the optical assembly.



# Apple Scanner

## Section 5 – Additional Procedures

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### □ CONTENTS

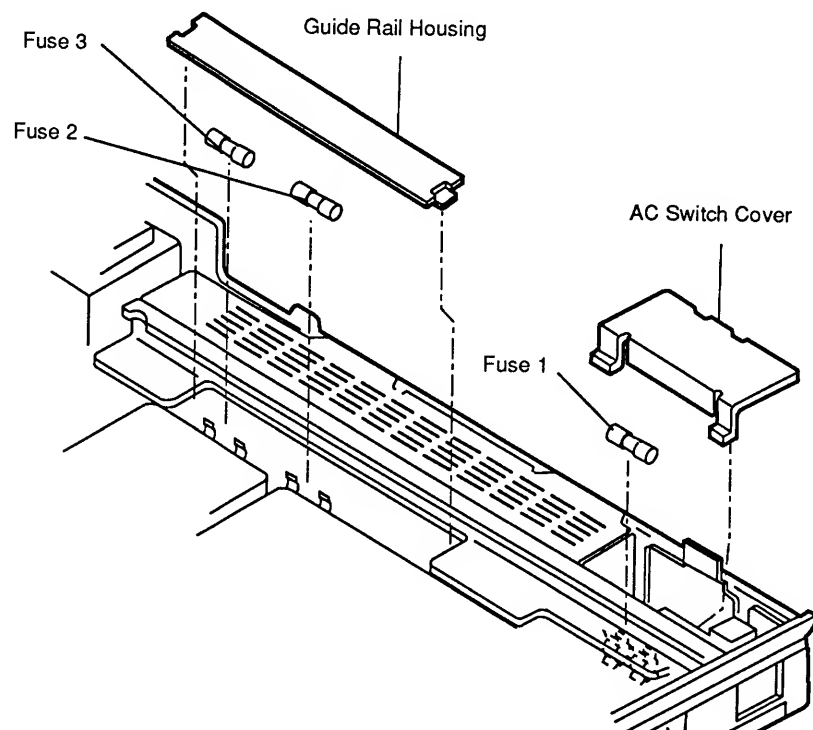
- 5.2 Power Supply Fuses
- 5.3 Main Logic Board Fuse
- 5.4 Selecting Correct Voltage
- 5.5 Bulb Replacement
  - 5.5 Remove the Bulb Assembly
  - 5.6 Install the Fluorescent Bulb
  - 5.7 Replace the Bulb Assembly
- 5.8 Voltage Conversion
  - 5.8 Comparison
  - 5.9 110 Volt to Universal
  - 5.9 Universal to 110 Volt
- 5.10 Main Logic Board Modification

---

## □ POWER SUPPLY FUSES

### Remove

1. Make sure power is switched off, and remove the power cord.
2. Remove the lid and the case top.
3. **Figure 5-1.** Remove the left guide rail housing from the guide rail by pulling up on the center of the housing with your forefinger. This exposes fuses 2 and 3 on the power supply.
4. **Figure 5-1.** Remove the AC switch cover by squeezing on the inside part of the housing and lifting it out from the rail guide. This exposes fuse 1 on the power supply.



**Figure 5-1 Power Supply Fuses**

5. **Figure 5-1.** To remove a fuse, use a fuse removal tool or carefully pry up one end of the fuse with a small flat-blade screwdriver. Pull the fuse out.

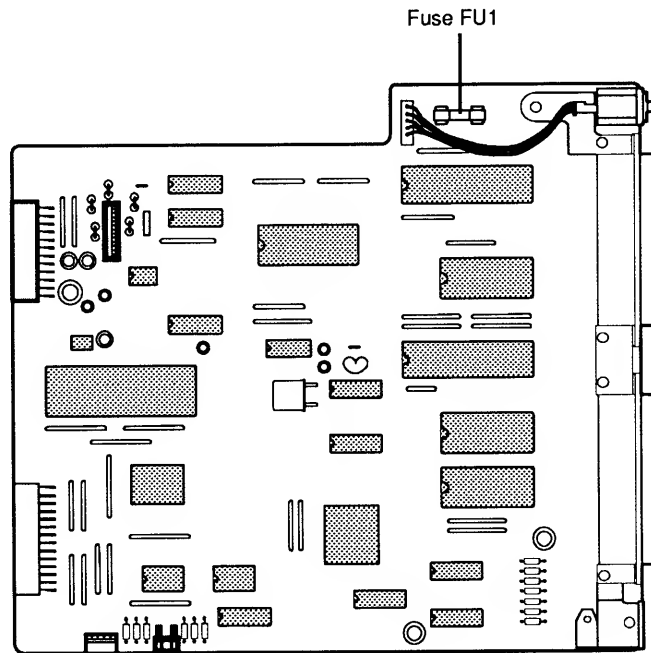
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## □ MAIN LOGIC BOARD FUSE

**Note:** This procedure applies only to the 4-bit scanner. The main logic board on the 8-bit scanner is totally encased in a metal shield. Do not open this shield.

### Replace

1. Remove the main logic board.
2. **Figure 5-2.** Locate the main logic board fuse (FU1). Remove the fuse with a fuse removal tool or carefully pry up one end of the fuse with a small screwdriver.



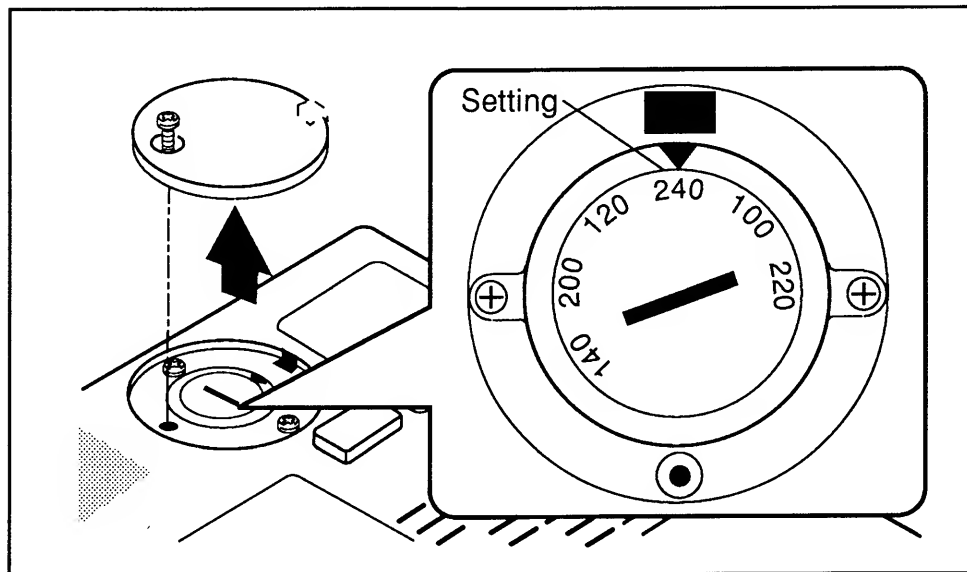
**Figure 5-2 Main Logic Board Fuse on 4-Bit Scanner**

3. Test the fuse with an ohmmeter as follows:
  - a) Set the meter to the times-1 scale or to the continuity range if the meter has one.
  - b) Put the leads across the fuse. If the meter reads *short* (zero on the scale, or the continuity beeper sounds), the fuse is good. If the meter reads *open* or the continuity beeper does not sound, the fuse is bad.
4. Replace the fuse if defective (see specifications or owner's manual for correct fuse replacement).

## ❑ SELECTING CORRECT VOLTAGE

To change the incoming voltage selector (on units supplied with universal selector switch):

1. Turn the scanner upside down and locate the cover plate on the bottom of the scanner.



**Figure 5-3 Voltage Selection**

2. **Figure 5-3.** Remove the Phillips screw and remove the cover plate.
3. Using a large flat-blade screwdriver or a coin, turn the voltage selector to match the correct incoming voltage.
4. Using the screw, reinstall the cover plate.

## □ BULB REPLACEMENT

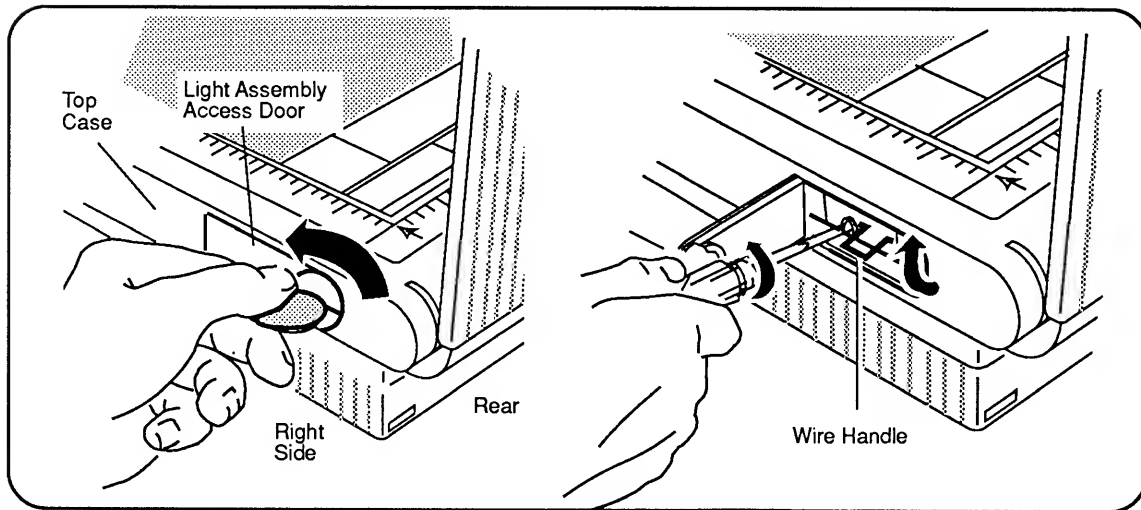
### Remove the Bulb Assembly

Follow the instructions below to remove the bulb without removing the case top.

1. Raise the lid to the vertical position.
2. Make sure the optical block (under the glass) is in the home position (the position closest to the back of the scanner). You can do this by powering on the scanner; the scanner will set the optical block to the home position.

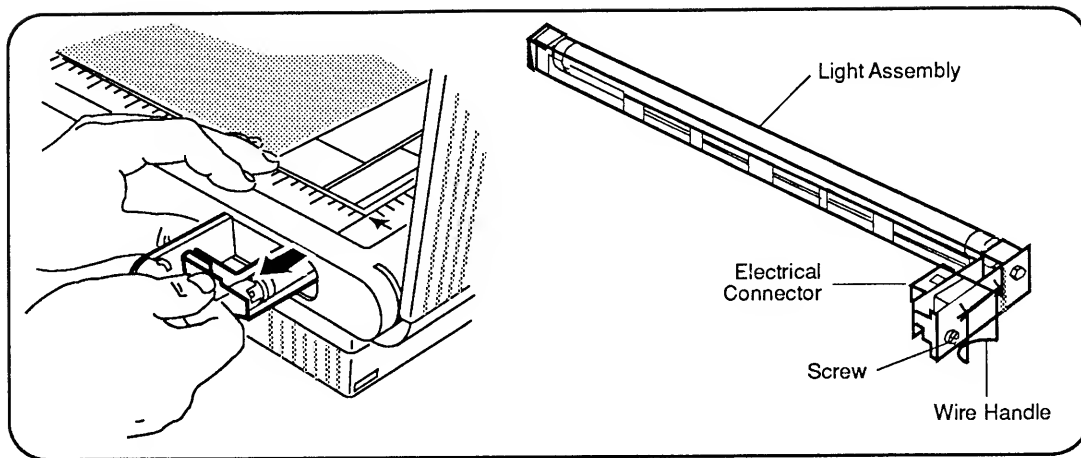
**Note:** The side door on the right side of the scanner must be closed and the latch must be fully locked (turned clockwise) for the scanner to power on and the optical block to reset to the home position. The latch activates an interlock switch. As soon as the latch is unscrewed (to the left), the interlock switch deactivates and the scanner will not power on.

3. **Figure 5-4A.** Using a large flat-blade screwdriver or a coin, unscrew (counterclockwise) the latch on the side door on the right side of the scanner.



**Figure 5-4 Removing the Bulb Assembly**

4. **Figure 5-4B.** Once the side door is opened, use a Phillips screwdriver to loosen the screw that holds the light bulb assembly to the optical block. (The screw does not come out.)



**Figure 5-5 Removing the Bulb Assembly**

5. **Figure 5-5.** Grasp the wire handle and gently pull the bulb assembly from the optical block. (If the bulb assembly offers resistance, it is possible that the screw is not loose enough. Try loosening the screw farther and pulling on the hook at the same time.)

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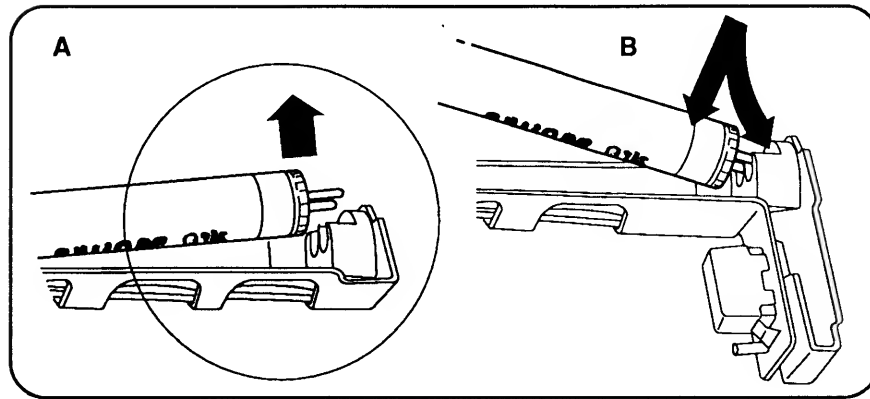
***WARNING:*** When replacing the fluorescent bulb, do not pull or pry the bulb anywhere on the glass area. The glass can shatter and cause serious injury.

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#### **Install the Fluorescent Bulb**

1. **Figure 5-6A.** Using a flat-blade screwdriver, carefully pry, on the metal ends only, one side of the fluorescent bulb until the two pins disengage from the socket.
2. Once one side of the bulb is loose, disengage the other side using the same method.
3. **Figure 5-6B.** To insert the new bulb, position the bulb so that the printing on the bulb faces down, or into, the holder. Then align the two pins on each end with the sockets on the bulb holder and press each end in, using firm but steady pressure. Do not press on the glass area of the bulb; the bulb can break and injure you.

**Note:** If the bulb has fingerprints on the glass, wipe the glass with a dry soft cloth before inserting the bulb in the assembly. Do not touch the glass again.



**Figure 5-6 Removing the Florescent Bulb**

#### **Replace the Bulb Assembly**

After the bulb has been replaced in the bulb assembly, replace the assembly into the optical block.

1. Insert the bulb assembly through the side door and make sure that the bottom frame of the bulb assembly fits into the groove slots on the optical block.
2. Push the assembly all the way in until the electrical connector makes contact with the socket on the optical block and the screw is lined up with the screw hole on the optical block.
3. Tighten the Phillips screw. (Tightening also draws the two connectors together.) If the assembly does not seem to be drawing into the optical block and the screw doesn't seem to be getting tighter, you may have to pull the assembly partly out and push it in again to reseal it.
4. Close the side door and turn the latch clockwise until the latch is fully tightened.
5. Turn the scanner on and make sure it activates to the home position. If it does not, then it is possible that the side door latch is not turned all the way to the right, thus deactivating the interlock switch.

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## □ VOLTAGE CONVERSION

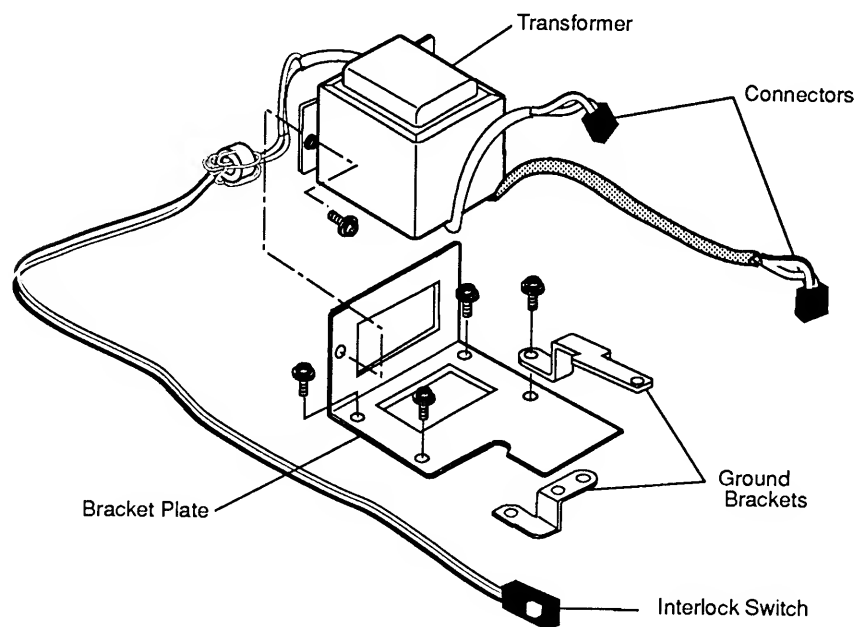
To convert a 110-volt scanner to a universal-voltage model, you must replace the 110-volt transformer assembly with the universal transformer assembly.

### Materials Required

Flat-blade screwdriver  
Phillips screwdriver  
Universal transformer assembly

### Comparison

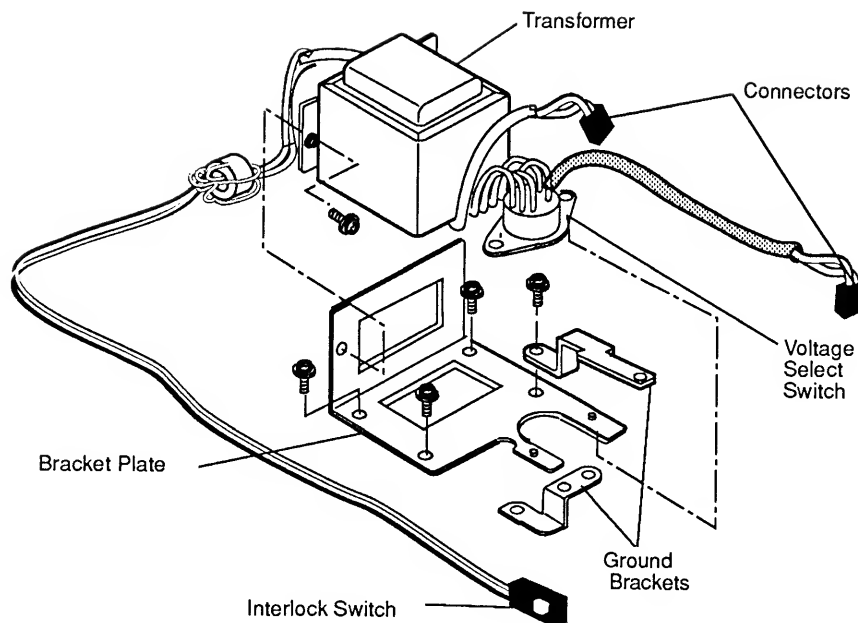
**Figure 5-7** shows the 110-volt version of the transformer assembly. The assembly consists of the transformer, the bracket plate, the attached connectors, the attached interlock switch, and two ground brackets.



**Figure 5-7 110-Volt Transformer Assembly**

**Figure 5-8** shows the universal transformer assembly. The assembly includes the transformer, the bracket plate (notice the cutout for the voltage selector switch), the attached connectors, the interlock switch, the voltage selector switch, and two ground brackets.





**Figure 5-8 Universal Transformer Assembly**

After installing the universal assembly, you must set the voltage selector switch to the correct input voltage.

**110 Volt  
to Universal**

To convert from the 110-volt version to a universal-voltage model, follow the procedure in "Transformer," in the Take-Apart section. Then set the voltage selector switch to the correct input voltage.

**Universal  
to 110 Volt**

You do not need to change any hardware; just change the voltage selector switch to the correct input voltage.

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## □ MAIN LOGIC BOARD MODIFICATION

**Note:** This procedure applies only to the 4-bit scanner. The main logic board on the 8-bit scanner is encased in a metal shield. Do not open this shield.

When an Apple Scanner is connected to a Macintosh SE/30, Macintosh IIfx, or Macintosh IIfx in combination with other SCSI devices (such as internal or external hard disks or the AppleCD SC), the following intermittent system problems may occur:

- The system will not boot.
- The system locks during transfer of data over the SCSI bus.

These system problems are the result of a scanner SCSI bus timing error caused by three capacitors on the main logic board. Removing the capacitors from the board eliminates the timing problem and has no effect on the scanner's performance. To remove the capacitors from the main logic board, perform the procedure described below.

### Materials Required

Medium Phillips screwdriver  
Small needlenose pliers  
Small diagonal cutters

## Procedure

1. Remove the main logic board.
2. Place the main logic board on a grounded workbench pad and put on your grounding wriststrap.
3. **Figure 5-9.** Locate the three capacitors at locations CA4, CA5, and CA6 on the main logic board, next to the SCSI connector at CN6.

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**CAUTION:** When removing the capacitors, be careful not to touch other components on the main logic board.

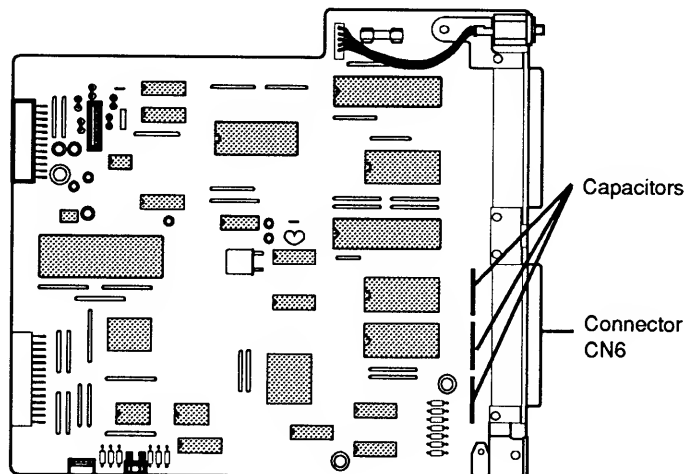
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4. Using your fingers or needlenose pliers, remove the three capacitors from the main logic board. Grasp each capacitor gently and bend back and forth until the connector pins are loose. Break or pull the capacitor off the board.

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**CAUTION:** Be careful not to break the capacitor by grasping it too tightly.

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**Figure 5-9 Main Logic Board (4-Bit Scanner)**

5. Using the small diagonal cutters, trim off any remaining capacitor pins.
6. Inspect and remove any debris from the board.
7. Replace the main logic board.

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# Apple Scanner

## Illustrated Parts List

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### □ CONTENTS

IPL.3	Miscellaneous Hardware Kit
IPL.5	Parts Location (Figure 1)
IPL.7	Cover Assembly (Figure 2)
IPL.9	Carrier Assembly (Figure 3)
IPL.11	Optical Assembly (Figure 4)
IPL.13	Cables, Power Supplies, and Logic Boards (Figure 5)

**Note:** The figures and lists in this section include all piece parts that can be purchased separately from Apple for the Apple Scanner, along with their part numbers. These are the only parts available from Apple. Refer to your *Apple Service Programs* manual for prices.

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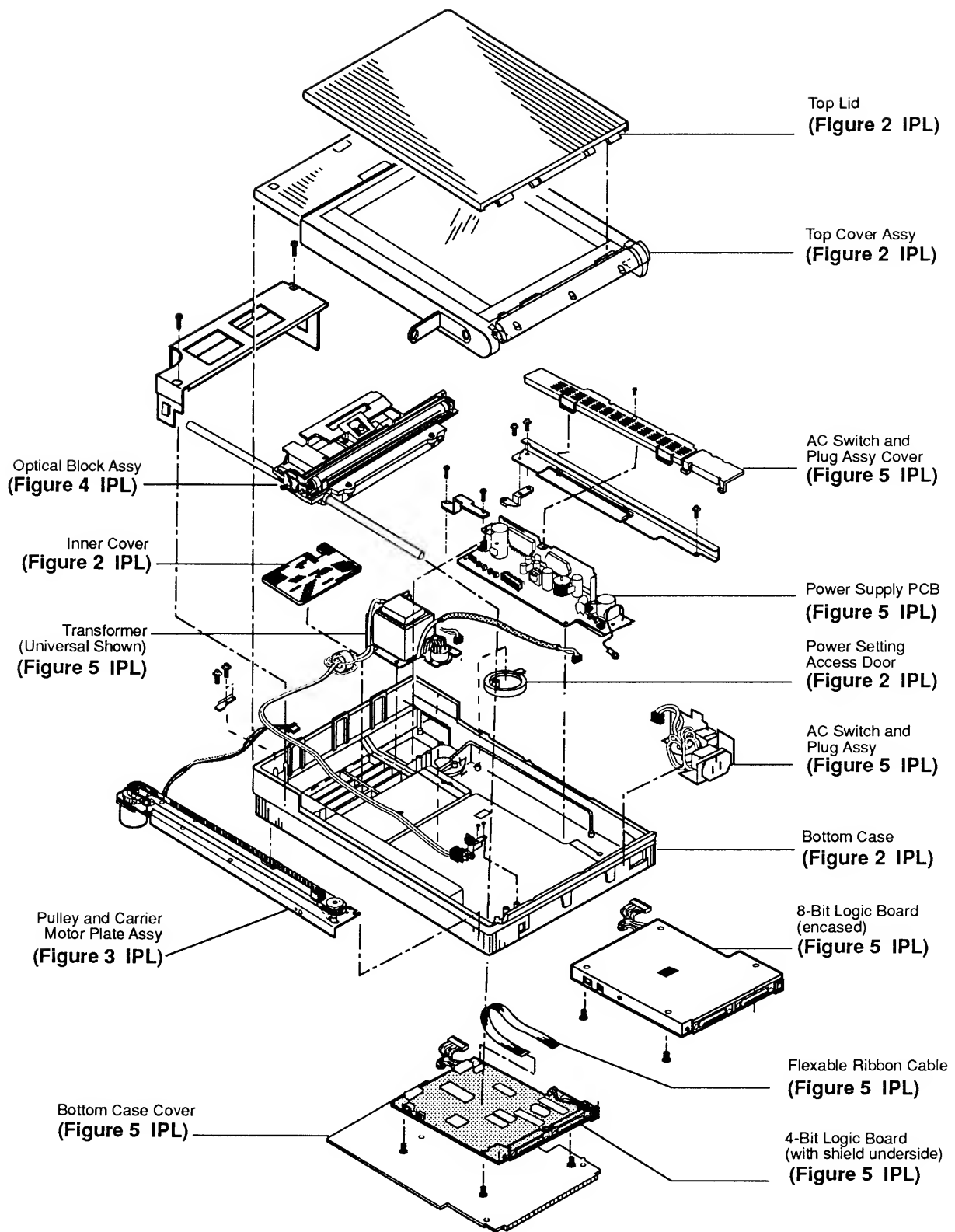
## ❑ MISCELLANEOUS HARDWARE KIT

<u>Part No.</u>	<u>Description</u>
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076-0289	Miscellaneous Hardware Kit
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The following piece parts are available in the Miscellaneous Hardware Kit:

<u>Part No.</u>	<u>Description</u>	<u>See Figure No.</u>
076-0277	Pan Head Screw 3 x 15 (10/pk)	Figure 2
076-0286	Screw 2, Cover (10/pk)	Figures 2 and 5
076-0273	Rubber Foot (10/pk)	Figure 2
076-0301	Tapping Screw 3 x 8 (10/pk)	Figures 2 and 5
076-0298	Ribbon Cable Holder, 4-bit (5/pk)	Figure 2
076-0272	Button Lamp Lock (5/pk)	Figure 2
076-0312	Belt Tension Spring (10/pk)	Figure 3
076-0292	Double Sems Screw 3 x 10 (20/pk)	Figure 4
076-0313	Carrier Stopper (10/pk)	Figure 4
076-0283	Fuse, 2 A, 250 V (10/pk)	Figure 5
076-0293	Double Sems Screw 3 x 6 (10/pk)	Figure 5
076-0284	Fuse, 1 A, 250 V (10/pk)	Figure 5
076-0285	Fuse, 3 A, 250 V (10/pk)	Figure 5
076-0294	Sems Screw 4 x 6 (10/pk)	Figure 5
076-0325	Double Sems Screw 4 x 8 (10/pk)	Figure 5



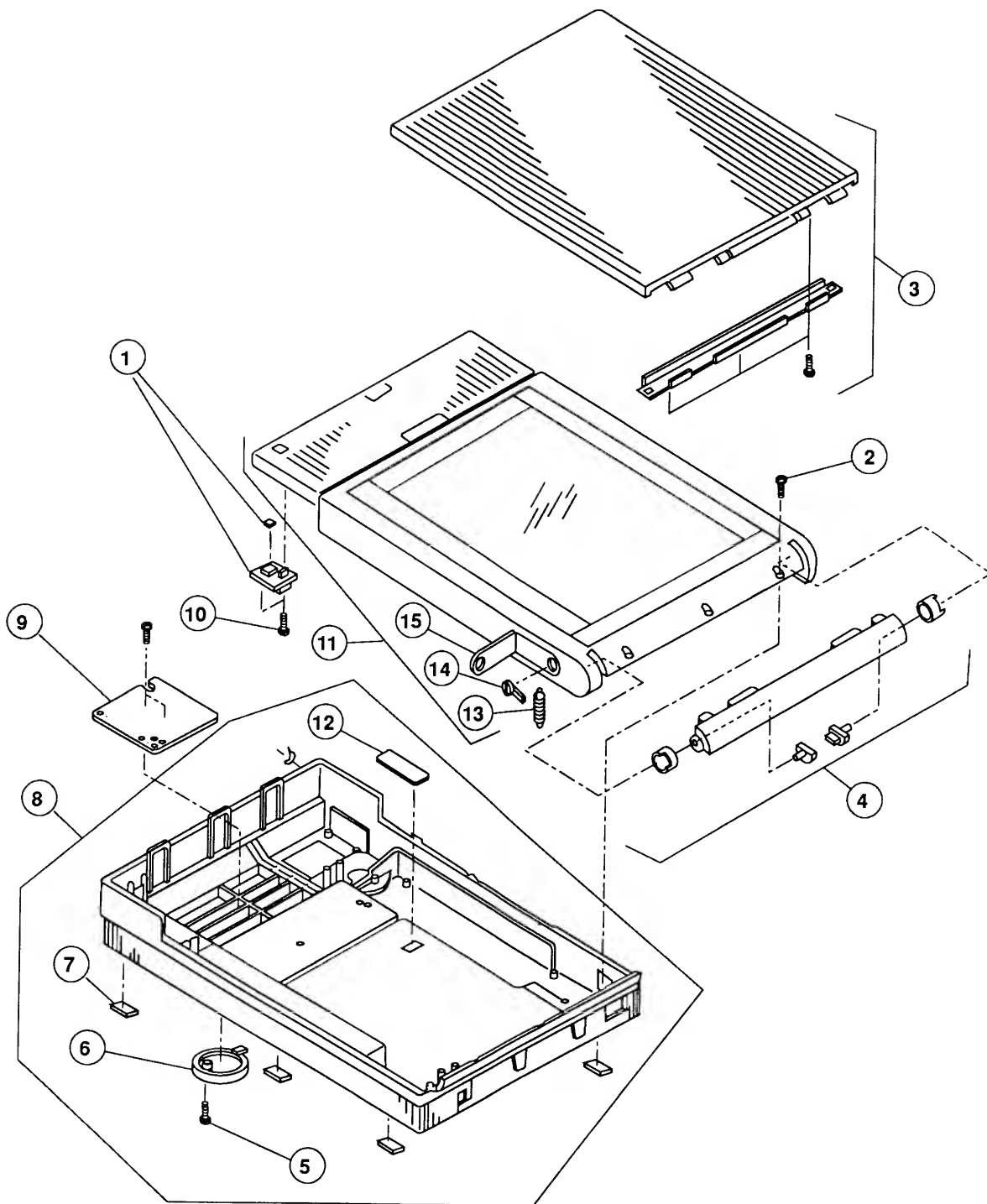
**Figure 1 Parts Location**



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## □ PARTS LOCATION (Figure 1)

<u>Description</u>	<u>See Figure No.</u>
Lid	Figure 2
Top Cover Assembly	Figure 2
AC Switch and Plug Assembly Cover	Figure 5
Power Supply PCB	Figure 5
Power Setting Access Door	Figure 2
AC Switch and Plug Assembly	Figure 5
Bottom Case	Figure 2
Main Logic Board	Figure 5
Cable, Optical Assy to Main Logic Board	Figure 4
Bottom Case Cover	Figure 5
Pulley and Carrier Motor Assembly	Figure 3
Transformer	Figure 5
Inner Cover	Figure 2
Optical Assembly	Figure 4

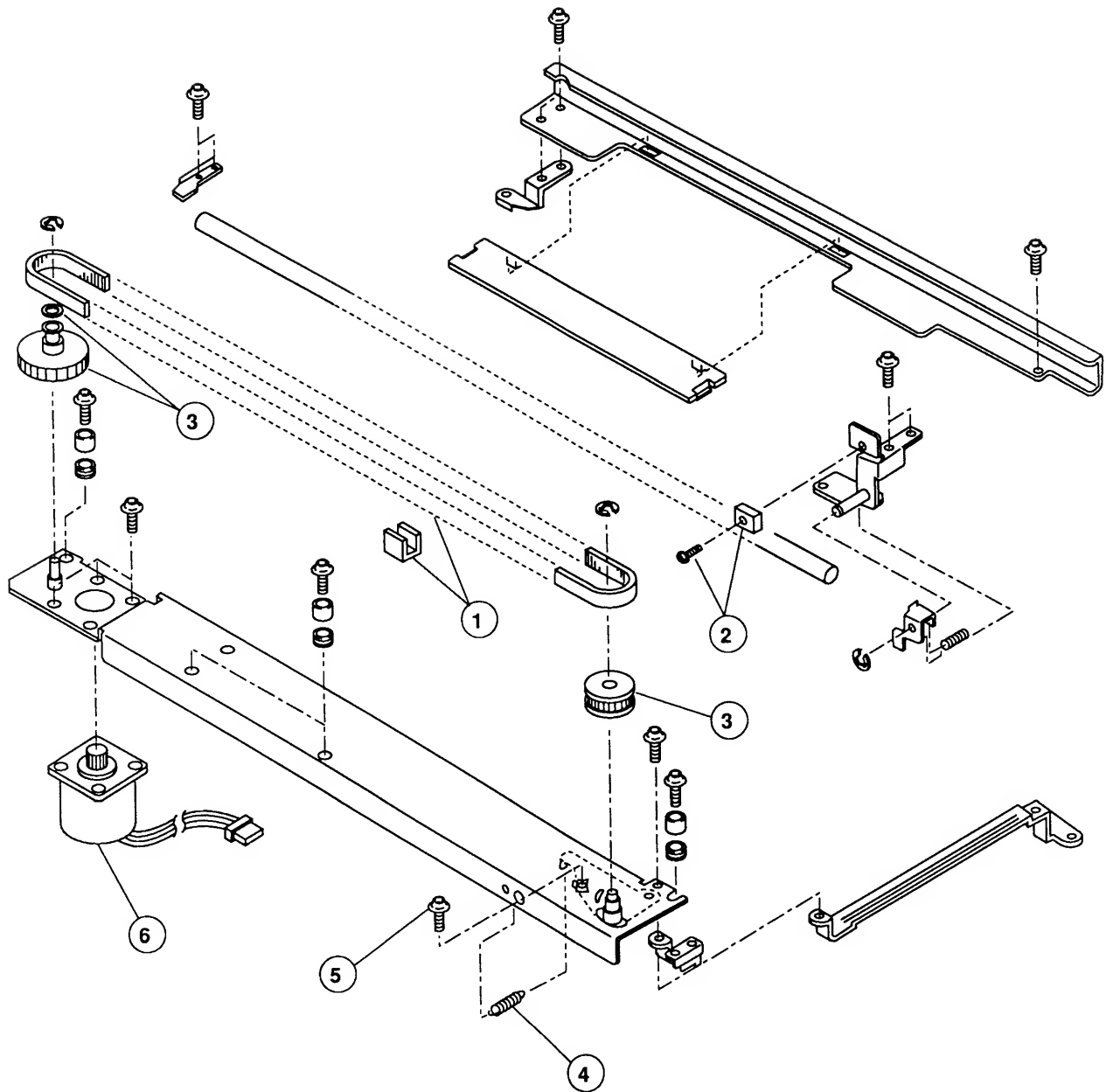


**Figure 2 Cover Assembly**

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## □ COVER ASSEMBLY (Figure 2)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
1	076-0278	Start Scan PCB Assembly
2	076-0277	Screw, Pan Head, 3 x 15 (10/pk)
3	949-0210	Lid
4	076-0275	Lid Hinge Assembly
5	076-0286	Cover Screw 2 (10/pk)
6	949-0209	Cover Switch (10/pk)
7	076-0273	Rubber Foot (10/pk)
8	949-0208	Bottom Case Assembly (4-bit scanner)
-	949-0315	Bottom Case Assembly (8-bit scanner)
9	949-0226	Interior Cover
10	076-0301	Tapping Screw 3 x 8 (10/pk)
11	949-0206	Top Case Assembly with Glass
12	076-0298	Ribbon Cable Holder (5/pk) (4-bit scanner)
13	076-0322	Slide Spring (10/pk)
14	076-0272	Lamp Lock Button (5/pk)
15	076-0314	Lamp Cover (5/pk)

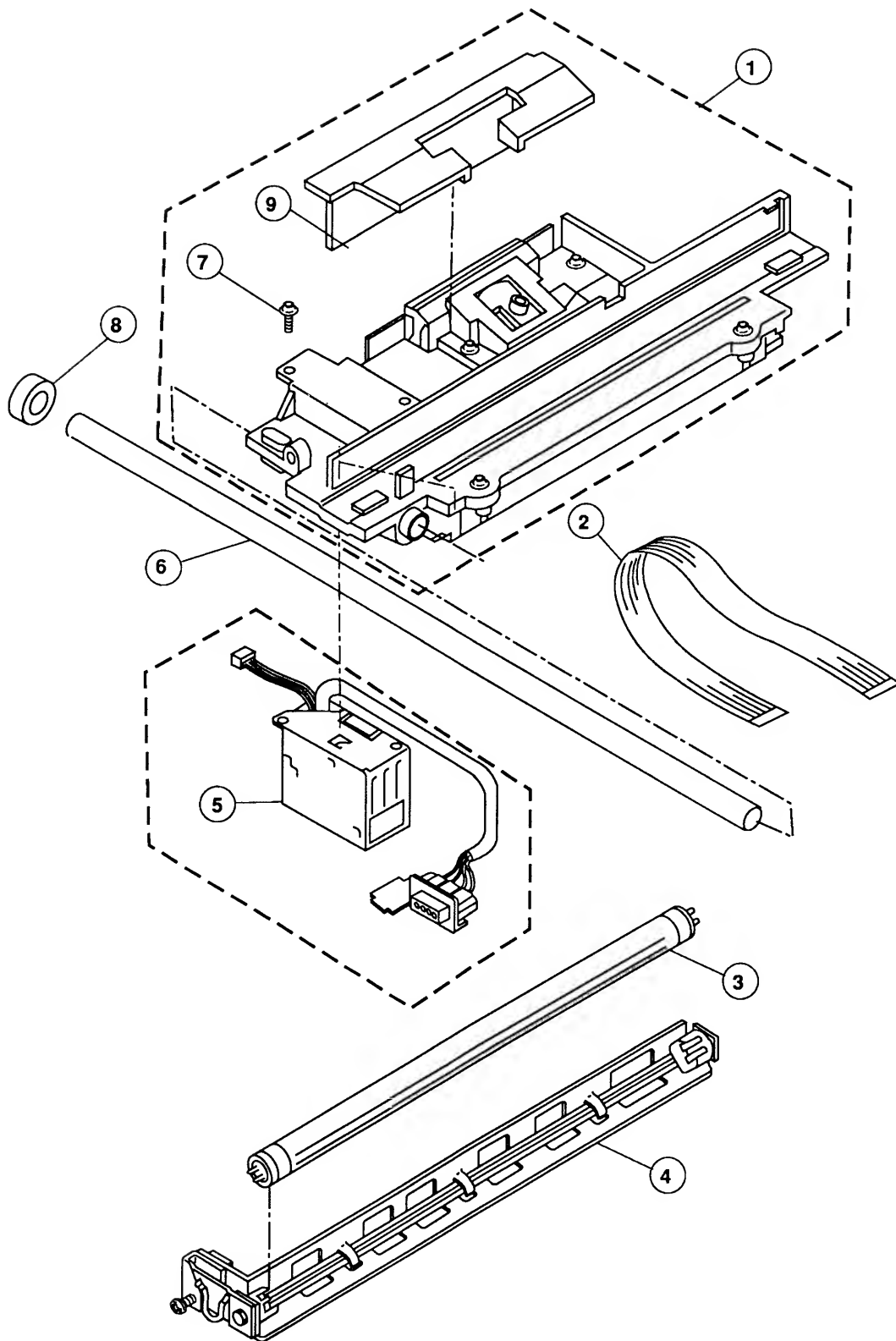


**Figure 3 Carrier Assembly**

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## □ CARRIER ASSEMBLY (Figure 3)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
1	076-0323	Drive Belt Assembly
2	076-0291	Limit Assembly Switch
3	076-0290	Carrier Block, Gears/Pulleys (5/pk)
4	076-0312	Belt Tension Spring (10/pk)
5	076-0293	Double Sems Screw 3 x 6 (10/pk)
6	959-0037	Carrier Motor Assembly

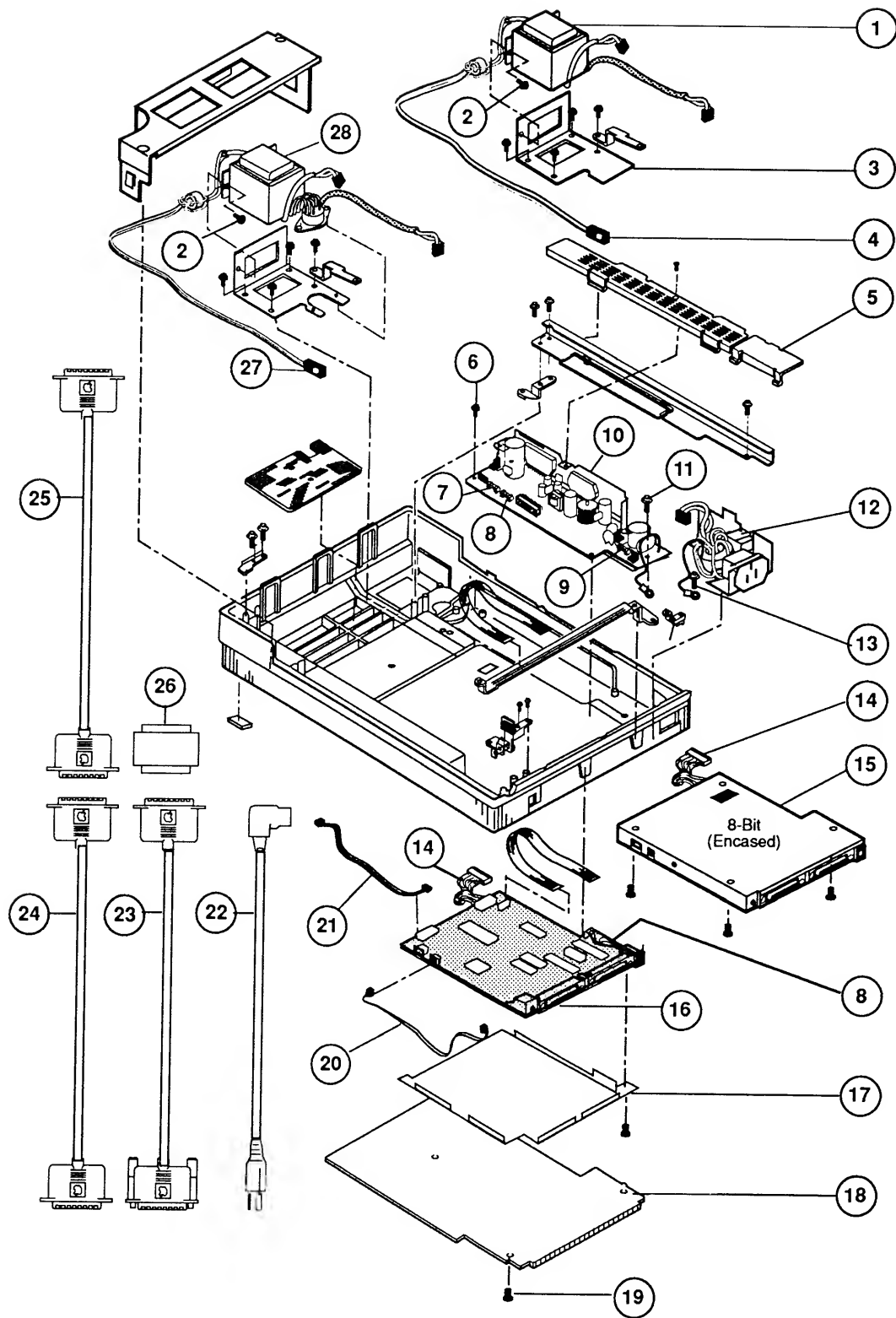


**Figure 4 Optical Assembly**

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## □ OPTICAL ASSEMBLY (Figure 4)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
1	661-0449	Optical Assembly (4-bit scanner)
	661-0634	Optical Assembly (8-bit scanner)
2	936-0043	Cable, Optical Assembly to Main Logic Board (4-bit scanner)
—	590-0525	Cable, Optical Assembly to Main Logic Board (8-bit scanner)
3	938-0005	Lamp
4	983-0008	Lamp Holder
5	076-0280	Inverter Assembly
6	699-0514	Optical Assembly Shaft
7	076-0292	Double Sems Screw 3 x 10 (20/pk)
8	076-0313	Carrier Stopper (10/pk)
9	949-0211	CCD PCB Cover



**Figure 5 Cables, Power Supplies, and Logic Boards**



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**□ CABLES, POWER SUPPLIES, AND LOGIC BOARDS (Figure 5)**

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
1	915-0039	Transformer Assembly, 100/240 V
2	076-0325	Double Sems Screw, 4 x 8 (10/pk)
3	948-0134	Transformer Bracket, 100/240 V
4	076-0315	Cover Interlock Switch, 220/240 V
5	949-0214	AC Switch Cover
6	076-0301	Tapping Screw 3 x 8 (10/pk)
7	076-0285	Fuse, 3 A, 250 V (10/pk)
8	076-0283	Fuse, 1 A, 250 V (10/pk)
9	076-0284	Fuse, 2 A, 250 V (10/pk)
10	661-0431	Power Supply Board
11	076-0293	Double Sems Screw 3 x 6 (10/pk)
12	937-0032	AC Switch Assembly
13	076-0294	Sems Screw 4 x 6 (10/pk)
14	936-0047	Cable, Power Supply Board to Main Logic Board
15	661-0635	Main Logic Board (8-bit scanner)
16	661-0534	Main Logic Board—Rev. B (4-bit scanner)
17	948-0128	Shield, Main Logic Board (4-bit scanner)
18	948-0037	Cover, Main Logic Board
19	076-0286	Cover Screw 2 (10/pk)
20	936-0045	Cable, Limit Switch Assembly
21	936-0044	Cable, Scan Switch Assembly
22	590-0380	AC Power Cord, Smoke, 110 V
23	658-8031	System Cable
24	658-8033	Extender Cable
25	658-8034	Peripheral Interface Cable
26	658-8032	Terminator
27	076-0300	Cover Interlock Switch, 110 V
28	915-0038	Transformer Assembly, 110 V

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